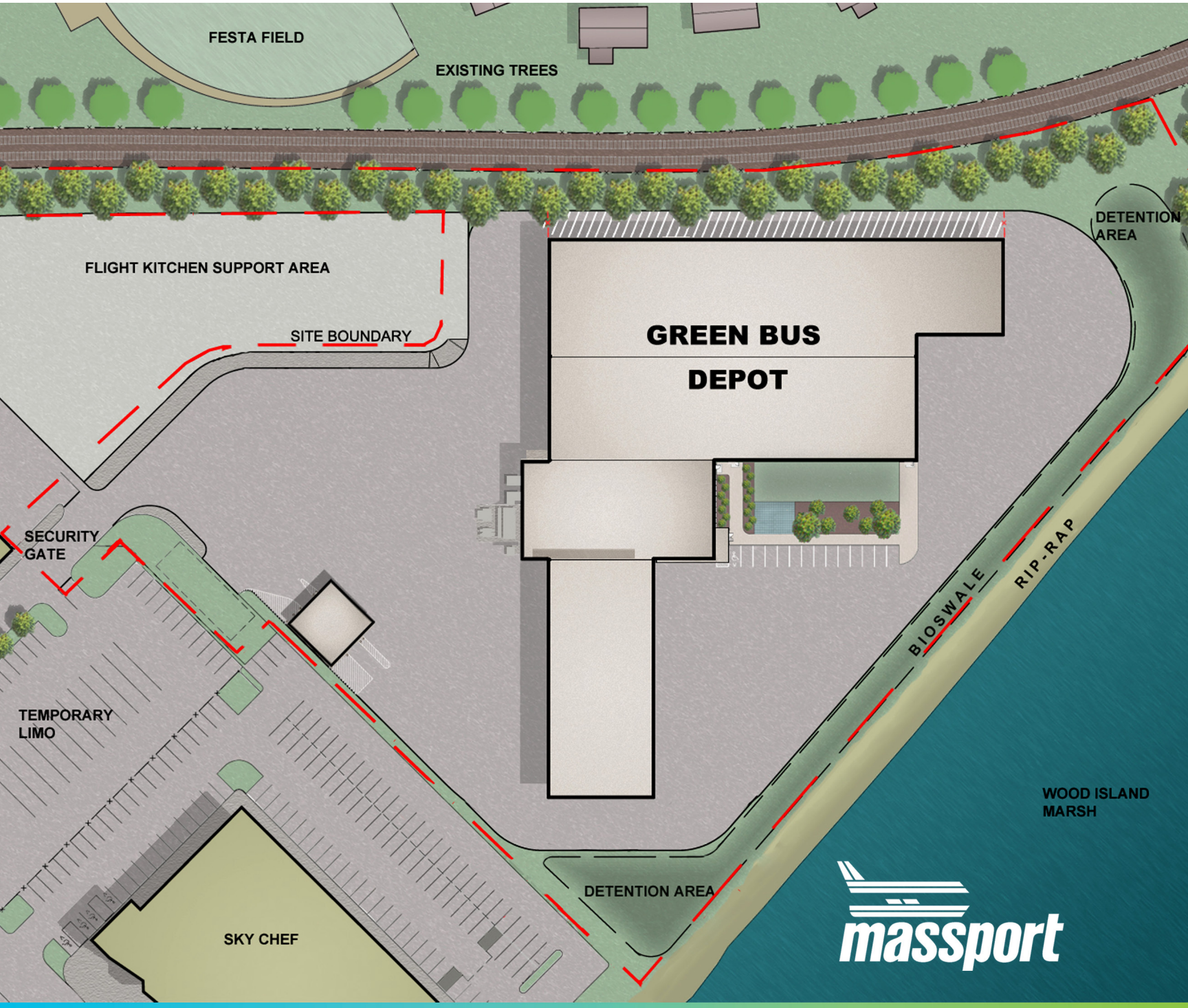
Green Bus Depot

Boston Logan International Airport

Environmental Notification Form



To: Massachusetts Environmental Policy Act Office
Executive Office of Energy and Environmental Affairs

By: Massachusetts Port Authority
One Harborside Drive
East Boston, MA 02118

July 2010

Prepared By: AECOM

Boston-Logan International Airport
Green Bus Depot
East Boston, Massachusetts

Environmental Notification Form
and
Environmental Notification Form Supplement

Submitted to:

Executive Office of Energy and Environmental Affairs
Massachusetts Environmental Policy Act Unit

Proponent:

Massachusetts Port Authority (Massport)
Logan Office Center, Suite 200S
East Boston, MA 02128

Comments must be received no later than August 20, 2010. Written comments may be addressed to:

Secretary Ian A. Bowles
Executive Office of Energy and Environmental Affairs (EEA)
Attn: MEPA Office
100 Cambridge Street, Suite 900
Boston, MA 02114

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Massachusetts Port Authority
One Harborside Drive, Suite 200S
East Boston, MA 02128-2909
Telephone (617) 568-5000
www.massport.com

July 15, 2010

Secretary Ian A Bowles
Executive Office of Energy and Environmental Affairs
100 Cambridge Street, Suite 900
Boston, Massachusetts 02114

and

Alicia McDevitt, MEPA Director
Executive Office of Energy and Environmental Affairs
100 Cambridge Street, Suite 900
Boston, Massachusetts 02114

Re: **Environmental Notification Form**
Green Bus Depot at Boston-Logan International Airport
East Boston, Massachusetts

Dear Secretary Bowles and Director McDevitt:

The Massachusetts Port Authority (Massport) is pleased to submit the enclosed Environmental Notification Form (ENF) for a Green Bus Depot to be constructed at Boston-Logan International Airport (Logan Airport).

The proposed Green Bus Depot will not only provide Massport with the necessary on-airport facilities to maintain a new fleet of clean-fuel shuttle buses as its aging fleet of CNG shuttle buses is replaced, but will also allow Massport to accommodate the new Unified Bus System, comprised of diesel-electric hybrid shuttle buses, that will serve Logan's new Consolidated Rental Car Facility (EEA # 14137). By constructing the Green Bus Depot on-airport, Massport will be able to shift more airport activity out of the community in a state-of-the-art facility. The new facility has been designed to minimize operational impacts to the adjacent neighborhoods, with particular focus on air quality and noise during periods when airport and MBTA activity is off-peak.

The Green Bus Depot will be constructed to Leadership in Energy and Environmental Design (LEED) and Massachusetts LEED Plus standards, with a goal of achieving LEED Silver status through a series of site design, energy efficiency, emissions reduction, noise abatement and water quality measures. In addition to the LEED measures, the Green Bus Depot will also be designed with long range operational flexibility to embrace new clean-fuel and low-emmitting bus technologies, as they become available.

Logan's new bus fleet will be comprised of 32 sixty-foot articulated clean diesel-electric hybrid buses, and 18 forty-foot or forty-two foot compressed natural gas (CNG) buses. The new fleet will be significantly more fuel efficient, have lower emissions and be quieter than the fleet currently in operation. As noted above, through implementation of the Consolidated Rental Car Facility project in Logan's Southwest Service Area (EEA # 14137), a new Unified Bus Fleet, with fewer than half the number of buses currently serving the existing rental car companies, will fully replace the existing rental car diesel bus fleet. While this alone results in a significant

environmental benefit, unless the Green Bus Depot is established on-airport, the entire Massport bus fleet, including the Unified Bus Fleet, will be required to travel along local roads through East Boston and Chelsea for daily maintenance and overnight storage.

By eliminating bus trips on local streets in East Boston and Chelsea neighborhoods, the project will improve traffic in congested Day Square and other local roads and reduce off-airport bus noise and emissions.

The Green Bus Depot will occupy a 7.7 acre secured-access site adjacent to the MBTA's Blue Line tracks in Logan Airport's North Service Area (NSA). The facility would include approximately 72,810 square feet of enclosed structures. The proposed structures, 13-15 employee parking spaces, and the site vehicular and pedestrian circulation, will cover approximately five acres. The building program, other than fueling station, has been organized into a single facility. The functional parts of the building were organized on the site with the quieter components – bus storage – located closest to the adjoining residential neighborhood to the north (which is separated from the Green Bus Depot by the MBTA tracks), and the noisier bus maintenance components to the south. The ultra low sulfur diesel fueling and storage (two - 10,000 gallon underground tanks) for the diesel-electric hybrid buses will be located on the southwest portion of the site near the site entrance and away from the neighborhood properties. Wash-water recycling equipment will allow reuse of approximately 70% of the wash water.

Access into the Green Bus Depot site would be via existing roadways. Bus circulation around the site will move in a counter-clockwise direction, minimizing travel movements. The maintenance bays are designed as drive-through bays, eliminating noise from backup alarms. The majority of bus operations will be shielded from the community by the proposed building and landscaping along the MBTA tracks. The continuous 'sound barrier' wall that encloses the north face of the building, in conjunction with the continuous berm planted with a double row of evergreen trees along the MBTA right-of-way, will minimize the transmission of sounds from the facility to the neighborhood. The development will significantly increase green space in this portion of the airport by creating a landscaped edge along the MBTA tracks, and vegetated detention basins and bioswale for stormwater control and enhancement adjacent to Wood Island Marsh.

As described more fully in the enclosed ENF, the planned facility and its associated program elements would offer significant environmental benefits including:

- Reduced impact of bus traffic on the East Boston community and neighborhoods in Chelsea.
- Incorporation of sustainable design elements in the building construction and operations.
- Construction of a significant new landscape edge at the property line screening the Neptune Circle and Swift Terrace neighborhoods and the North Service Area section of Logan Airport.
- Provision of transit, pedestrian and bicycle access for employees.
- Improvements in the quality and reduction in the quantity of stormwater runoff to Wood Island Marsh.

The results of the noise modeling indicate that there are no significant noise impacts associated with the Green Bus Depot project. Future 24-hour day-night cumulative noise levels (Ldn) are the same as under existing conditions and are, therefore not predicted to exceed the Federal Aviation Administration (FAA) criteria. Peak-hour noise levels during maximum bus activity are not predicted to exceed the Massachusetts Department of Environmental Protection (DEP) criteria of 10 decibels above measured background levels. The peak-hour noise levels are also not predicted to exceed the City of Boston Air Pollution Control Committee's nighttime threshold of 50 decibels.

No exceedances of the National Ambient Air Quality Standards (NAAQS) or the Massachusetts DEP Significant Impact Levels (SIL) are predicted from on-site operations. Future emissions for the non attainment ozone precursors (volatile organic compounds (VOC) and oxides of nitrogen (NOx)) and carbon monoxide (CO) are predicted to be well below *de minimus* levels. Therefore, no formal conformity determination is required. The Green Bus Depot is also predicted to reduce greenhouse gas emissions (CHG) approximately 20 percent compared to the baseline condition by utilizing CNG and diesel-electric buses. As a result, the Green Bus Depot (while not required as part of this ENF) is expected to comply with the Massachusetts Environmental Policy Act (MEPA) Unit's recently-revised *Greenhouse Gas Policy and Protocol* (May 5, 2010).

We anticipate that the Executive Office of Energy and Environmental Affairs (EEA) will publish the notice of availability in the July 21, 2010 edition of the *Environmental Monitor*, commencing the public review period. Massport requests that the 20-day ENF public review period be extended to 30 days (public comments due by August 20, 2010) to allow state agencies, local government departments and the public additional time to review the ENF. A MEPA site visit will be held on August 12, 2010 at the Logan Office Center at 11:00 AM.

Pursuant to MEPA Regulations, a copy of this ENF will be made available to the local public libraries and additional copies will be made available upon request. Requests for copies of the ENF should be directed to Tom Ennis at 617-568-1090 or via e-mail at tennis@massport.com.

We look forward to the review of this document. Please do not hesitate to contact me if you have any questions.

Very truly yours,

Thomas W. Ennis
Senior Project Manager/Senior Planner
Massachusetts Port Authority

Enclosure
cc. Distribution List

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Commonwealth of Massachusetts
Executive Office of Energy and Environmental Affairs
■ **MEPA Office**

For Office Use Only *Executive Office of Energy & Environmental Affairs*
EEA No.: MEPA Analyst: Phone: 617-626-

ENF Environmental Notification Form

The information requested on this form must be completed to begin MEPA Review in accordance with the provisions of the Massachusetts Environmental Policy Act, 301 CMR 11.00.

Project Name: Logan Airport Green Bus Depot		
Street: Lovell Street, North Service Area, Logan International Airport		
Municipality: East Boston	Watershed: Boston Harbor	
Universal Tranverse Mercator Coordinates:	Latitude: -71.02 Longitude: 42.38	
Estimated commencement date: February 2011	Estimated completion date: August 2012	
Approximate cost: $20 million	Status of project design: 15% complete	
Proponent: Massachusetts Port Authority (Massport)		
Street: One Harborside Drive, Suite 200S		
Municipality: East Boston	State: MA	Zip Code: 02128
Name of Contact Person From Whom Copies of this ENF May Be Obtained: Thomas W. Ennis		
Firm/Agency: Massachusetts Port Authority	Street: One Harborside Drive, Suite 200S	
Municipality: East Boston	State: MA	Zip Code: 02128
Phone: 617.568.1090	Fax: 617.568.3115	E-mail: tennis@massport.com

Does this project meet or exceed a mandatory EIR threshold (see 301 CMR 11.03)?
☐Yes ☒No

Has this project been filed with MEPA before?
☐Yes (EOEA No._____) ☒No

Has any project on this site been filed with MEPA before?
☒Yes (EOEA No. 13456) ☐No

Is this an Expanded ENF (see 301 CMR 11.05(7)) requesting:

a Single EIR? (see 301 CMR 11.06(8))	☐Yes	☒No
a Special Review Procedure? (see 301CMR 11.09)	☐Yes	☒No
a Waiver of mandatory EIR? (see 301 CMR 11.11)	☐Yes	☒No
a Phase I Waiver? (see 301 CMR 11.11)	☐Yes	☒No

Identify any financial assistance or land transfer from an agency of the Commonwealth, including the agency name and the amount of funding or land area (in acres): **Financial aid for various aspects of the Green Bus Depot Project may be sought from the Commonwealth.**

Are you requesting coordinated review with any other federal, state, regional, or local agency?
☐Yes(Specify_____) ☒No

List Local or Federal Permits and Approvals: Boston Conservation Commission Order of Conditions, Boston Water and Sewer Commission Sewer Permit, Federal Aviation Administration Notice of Construction, Army Corps of Engineers Section 404 Category 1 General Permit, National Pollutant Discharge and Elimination System (NPDES) Permit, FAA NEPA Categorical Exclusion.

Which ENF or EIR review threshold(s) does the project meet or exceed (see 301 CMR 11.03):

☒ Land	☐ Rare Species	☐ Wetlands, Waterways, & Tidelands
☐ Water	☐ Wastewater	☐ Transportation
☐ Energy	☐ Air	☐ Solid & Hazardous Waste
☐ ACEC	☐ Regulations	☐ Historical & Archaeological Resources

Summary of Project Size & Environmental Impacts	Existing	Change	Total	State Permits & Approvals
LAND				☒ Order of Conditions ☐ Superseding Order of Conditions ☐ Chapter 91 License ☒ 401 Water Quality Certification (through NOI) ☐ MHD or MDC Access Permit ☐ Water Management Act Permit ☐ New Source Approval ☒ DEP or MWRA Sewer Connection/ Extension Permit ☒ Other Permits (*including Legislative Approvals*) – Specify: Certification for emergency generator under DEP Environmental Results Program (ERP)
Total site acreage	7.7			
New acres of land altered				
Acres of impervious area	0	5.1	5.1	
Square feet of new bordering vegetated wetlands alteration		N/A		
Square feet of new other wetland alteration		N/A		
Acres of new non-water dependent use of tidelands or waterways		5.1		
STRUCTURES				
Gross square footage	0	72,810	72.810	
Number of housing units	0	0	0	
Maximum height (in feet)	0	24	24	
TRANSPORTATION				
Vehicle trips per day	Occasional vehicle trips by construction vehicles for materials storage and overflow parking	340	340	
Parking spaces	0	13 -15	13 -15	

WATER/WASTEWATER			
Gallons/day (GPD) of water use	0	16,525 GPD, of which 11,025 GPD will be reclaimed.	16,525 GPD, of which 11,025 GPD will be reclaimed.
GPD water withdrawal	N/A		
GPD wastewater generation/ treatment	0	5,500 GPD	5,500 GPD
Length of water/sewer mains (in miles)	0		

CONSERVATION LAND: Will the project involve the conversion of public parkland or other Article 97 public natural resources to any purpose not in accordance with Article 97?

☐Yes (Specify_____) ☒No

Will it involve the release of any conservation restriction, preservation restriction, agricultural preservation restriction, or watershed preservation restriction?

☐Yes (Specify_____) ☒No

RARE SPECIES: Does the project site include Estimated Habitat of Rare Species, Vernal Pools, Priority Sites of Rare Species, or Exemplary Natural Communities?

☐Yes (Specify_____) ☒No

HISTORICAL /ARCHAEOLOGICAL RESOURCES: Does the project site include any structure, site or district listed in the State Register of Historic Place or the inventory of Historic and Archaeological Assets of the Commonwealth?

☐Yes (Specify_____) ☒No

If yes, does the project involve any demolition or destruction of any listed or inventoried historic or archaeological resources?

☐Yes (Specify_____) ☒No

AREAS OF CRITICAL ENVIRONMENTAL CONCERN: Is the project in or adjacent to an Area of Critical Environmental Concern?

☐Yes (Specify_____) ☒No

PROJECT DESCRIPTION: The project description should include **(a)** a description of the project site, **(b)** a description of both on-site and off-site alternatives and the impacts associated with each alternative, and **(c)** potential on-site and off-site mitigation measures for each alternative (*You may attach one additional page, if necessary*.)

Site Description - The project site is generally a flat 7.7 acre triangular parcel of land in the North Service Area (NSA) of Logan Airport. The project site is bordered by the Massachusetts Bay Transportation Authority (MBTA) Blue Line tracks, Boston Harbor/Wood Island Marsh, and existing buildings housing Logan flight kitchens.

The project site is almost entirely covered with gravel, unvegetated and unpaved, and is currently and has historically been used for a range of aviation support activities including vehicle and equipment storage, overflow parking, and construction staging. The main access point is located on the western edge of the site, between the two existing flight kitchen buildings. The southern edge of the site borders Boston Harbor/Wood Island Marsh. Resource areas located on and adjacent to the site include: the coastal bank of Boston Harbor/Wood Island Marsh; filled Commonwealth tidelands; and flowed Commonwealth tidelands (Wood Island Marsh adjacent to site).

Alternatives Considered - Under a No-Build Alternative, the Massport bus fleet would continue to be maintained off-airport at the existing facility on Eastern Avenue in Chelsea. This alternative was dropped from further consideration as it would have

resulted in the buses continuing to travel through East Boston and Chelsea to reach the maintenance facility for service and overnight storage.
The Build Alternative would provide a LEED certified on-airport facility in the North Service Area to service and store the new fleet of diesel-electric hybrid and CNG fueled buses which are more efficient, reduce emissions and are much quieter. The on-airport location will eliminate airport buses traveling on local streets through East Boston and Chelsea, except for those serving the employee parking garage in Chelsea. This will reduce noise and air emissions in the East Boston and Chelsea neighborhoods through which the buses now travel. Various siting options were considered for the facility. Site layouts included schemes built out along the northern edge of the site parallel to the MBTA tracks and schemes favoring the harbor edge of the site. Facility layouts included options for a single large structure, as well as a series of smaller buildings arranged on the site. The design of the Preferred Alternative reduces impacts on the neighboring community. The enclosed and covered portions of the building would be located in the northeast corner of the site, with the majority of bus operations shielded from the community by the landscape edge and berm along the MBTA tracks, and the building itself, which will have a solid noise attenuating wall facing the community. Bus circulation would be arranged in a counter-clockwise loop around the site, with drive-through bus maintenance bays to minimize the need for back-up alarms. Roof-top equipment will be shielded from the community by the higher roof of the bus storage building. The use of low-height, low-cutoff light fixtures will limit light emittance from the building and site, and the landscaped edge area will further reduce site visibility from the Swift Terrace and Neptune Circle neighborhoods to the northwest of the project site.

Project Description - The proposed Green Bus Depot would include approximately 72,810 square feet of enclosed structure that would house most of the program functions. Ultra low sulfur diesel fuel for the hybrid busses will be stored within two (2) 10,000 gallon below grade storage tanks, with bus fueling station housed in a structure near the site entrance gate. Wash-water recycling equipment will allow reuse of approximately 70% of the bus wash water. The structures and limited employee parking spaces, and the site vehicular and pedestrian circulation cover a total of approximately five acres. The balance of the developed parcel would include an evergreen landscape edge and berm along the MBTA tracks, and a vegetated area with the stormwater detention basins and bioswale to enhance the quality of stormwater runoff adjacent to the marsh. Site access would be via a planned new roadway extension from the existing airport roadway system. Pedestrian access will be provided from the MBTA Wood Island station to encourage employees to use public transit to access the site.

The building arrangement locates the quietest facility elements closest to neighboring homes and further shields those homes with a noise- and reverberation-mitigating sound wall. To further dampen the ambient noise, an earthen berm (approximately 2 feet high) will be constructed along the northern edge of the site. To minimize sounds from the building's operations, most rooftop equipment will be installed on the lowest roof, away from nearby neighborhoods. The higher roof of the bus storage structure serves to shield the neighborhood from the rooftop equipment. The site circulation is designed for efficient one-way bus travel in order to limit unnecessary movements and to curtail bus back-up alarms.

The proposed Massport Green Bus Depot would have space dedicated to:

- Administration: office, work areas, and staff support spaces for personnel administering the operations of Massport's bus fleet;
- Transportation: supervisory office, drivers' areas, lunch rooms, and restroom/locker facilities for personnel operating the bus fleet;
- Building Support: mechanical, electrical, telecom and other facilities support spaces;
- Maintenance: repair bays, workshops, parts storage, supervisory office, restroom/locker/shower facilities, and support spaces for maintenance personnel;
- Bus Service: bus washing, fueling, and interior cleaning functions;
- Bus Parking: enclosed/heated parking space for a portion of the bus fleet, and a covered canopy structure for storage of the remainder of the bus fleet; and
- Site Requirements: limited employee parking, fuel storage/generation, waste storage/disposal, bicycle parking, bus site circulation, shielded employee outdoor break area, and site landscaping.

The Massport Green Bus Depot project will incorporate sustainable design and construction practices, in accordance with the Massport Sustainable Design Standards and Guidelines, and the Commonwealth's "Massachusetts LEED Plus" standard. The project intends to pursue LEED 2009 Certification through the US Green Building Council/Green Building Certification Institute (USGBC/GBCI), with a project goal of attaining the LEED "Silver" level of Certification.

LAND SECTION – all proponents must fill out this section

I. Thresholds / Permits

A. Does the project meet or exceed any review thresholds related to **land** (see 301 CMR 11.03(1)
_**X**_ Yes ___ No; if yes, specify each threshold:

The creation of five or more acres of impervious area.

II. Impacts and Permits

A. Describe, in acres, the current and proposed character of the project site, as follows:

	Existing	Change	Total
Footprint of buildings	**0**	**1.7**	**1.7**
Roadways, gravel, parking, and other paved areas	**5.1[1]**	**-1.7**	**3.4**
Other altered areas (describe)	**2.6[1]**	**0**	**2.6[2]**
Undeveloped areas	**0[1]**	**0**	**0**

1. The existing site is entirely altered. Most of the area is covered by gravel and is used for overflow parking and construction staging.
2. Areas not covered by buildings, roadways, and parking will be used for landscaping and drainage.

B. Has any part of the project site been in active agricultural use in the last three years?
___ Yes _**X**_ No; if yes, how many acres of land in agricultural use (with agricultural soils) will be converted to nonagricultural use?

C. Is any part of the project site currently or proposed to be in active forestry use?
___ Yes _**X**_ No; if yes, please describe current and proposed forestry activities and indicate whether any part of the site is the subject of a DEM-approved forest management plan:

D. Does any part of the project involve conversion of land held for natural resources purposes in accordance with Article 97 of the Amendments to the Constitution of the Commonwealth to any purpose not in accordance with Article 97? ___ Yes _**X**__ No; if yes, describe:

E. Is any part of the project site currently subject to a conservation restriction, preservation restriction, agricultural preservation restriction or watershed preservation restriction?___ Yes _**X**_ No; if yes, does the project involve the release or modification of such restriction? ___ Yes ___ No; if yes, describe:

F. Does the project require approval of a new urban redevelopment project or a fundamental change in an existing urban redevelopment project under M.G.L.c.121A? ___ Yes _**X**_ No; if yes, describe:

G. Does the project require approval of a new urban renewal plan or a major modification of an existing urban renewal plan under M.G.L.c.121B? ___Yes _**X**__ No ; if yes, describe:

H. Describe the project's stormwater impacts and, if applicable, measures that the project will take to comply with the standards found in DEP's Stormwater Management Policy:

The proposed drainage system will be designed such that the peak runoff rate for the post-development conditions does not exceed the pre-development runoff rate. The existing outfall pipe will be utilized as part of the proposed stormwater drainage system. Stormwater runoff from the eastern portion of the site will be directed to two detention basins and a bioswale that will be constructed along the eastern edge of the site as mitigation measures. The detention basins will be designed with a sediment forebay and extended detention to allow suspended solids to settle out, thereby improving the quality of stormwater discharging from the site. The stormwater from the western side of the site will be collected in a drainage system consisting of catch basins with sumps and sediment control structures. The sediment control structures will be sized to provide treatment for total suspended solids (TSS) removal in accordance with Massachusetts DEP

Stormwater Management Standards. The outlets from the sediment control structures will be connected to the existing drainage system. This will allow the stormwater to be treated prior to being discharged into the tidal marsh through the existing (permitted) Northwest outfall. If possible, the stormwater runoff from the roof may be infiltrated depending on the depth to groundwater and the permeability of the existing soils. Further soil testing is being performed to determine feasibility.

Since work is proposed within 100 feet of the coastal bank, a Notice of Intent will be submitted to the Boston Conservation Commission addressing the project scope, impacts to resource areas, and proposed mitigation measures, notably regarding compliance with MA DEP Stormwater Management Policy.

Since the project involves disturbance of greater than one acre of land, a Stormwater Pollution and Prevention Plan will be prepared in accordance with the National Pollutant Discharge and Elimination System (NPDES) General Permit for Construction Activities.

The project will meet Massport stormwater management guidelines and will meet LEED/ LEED Plus sustainable design standards in the development, construction, and operation of the facility, including in relation to stormwater.

I. Is the project site currently being regulated under M.G.L.c.21E or the Massachusetts Contingency Plan? Yes ___ No _**X**_ ; if yes, what is the Release Tracking Number (RTN)?

There are no regulated sites in the project area. There is one closed RTN (3-0016897) near the site at 1 Wood Island Park. A Response Action Outcome (RAO) was issued for this site in 2000 and it was deemed to pose No Significant Risk.

J. If the project is site is within the Chicopee or Nashua watershed, is it within the Quabbin, Ware, or Wachusett subwatershed? ___ Yes _**X**__ No; if yes, is the project site subject to regulation under the Watershed Protection Act? ___ Yes ___ No

K. Describe the project's other impacts on land:

The Preferred Alternative incorporates most of the program functions in a single connected structure, with the bus fueling functions housed in a separate fueling island structure near the site entrance gate. The enclosed and covered portions of the building would be located in the northeast corner of the site, with the majority of bus operations shielded from the community by the evergreen landscape edge and berm along the MBTA tracks, and the building itself, which will have a solid noise attenuating wall facing the community. Bus circulation is arranged in a counter-clockwise loop around the site.

The facility would include approximately 72,810 square feet of enclosed structure. The facility together with employee parking and site circulation will cover approximately 5 acres. The balance of the parcel would include a landscape buffer along the MBTA tracks and the vegetated detention basins and bioswale within the wetlands buffer zone along the waterfront.

III. Consistency

A. Identify the current municipal comprehensive land use plan and the open space plan and describe the consistency of the project and its impacts with that plan(s):

See Section 4 – *Consistency with Prior Planning* in the attached ENF Supplement

B. Identify the current Regional Policy Plan of the applicable Regional Planning Agency and describe the consistency of the project and its impacts with that plan:

The Green Bus Depot is not included in the Boston Region Metropolitan Planning Organization's *Journey to 2030*, but it will service the Massport bus fleet, as well as the Unified Bus Fleet serving the Consolidated Rental Car Facility (ConRAC), which is part of the Recommended Transportation

Plan. The Green Bus Depot facility will service a new fleet of 50 diesel-electric hybrid and CNG buses which are more efficient, reduce emissions and are much quieter than the existing buses. The new bus fleet will support an efficient and environmentally superior shuttle bus operation that will help Massport meet current and future ground access needs and provide improved access to the regional transportation network.

C. Will the project require any approvals under the local zoning by-law or ordinance (i.e. text or map amendment, special permit, or variance)? Yes ___ No _**X**__ ; if yes, describe:

D. Will the project require local site plan or project impact review?
___ Yes _**X**__ No; if yes, describe:

RARE SPECIES SECTION

I. Thresholds / Permits

A. Will the project meet or exceed any review thresholds related to **rare species or habitat** (see 301 CMR 11.03(2))? ___ Yes _**X**_ No; if yes, specify, in quantitative terms:

B. Does the project require any state permits related to **rare species or habitat**? ___ Yes _**X**_ No

C. If you answered "No" to both questions A and B, proceed to the **Wetlands, Waterways, and Tidelands Section**. If you answered "Yes" to either question A or question B, fill out the remainder of the Rare Species section below.

II. Impacts and Permits

A. Does the project site fall within Priority or Estimated Habitat in the current Massachusetts Natural Heritage Atlas (attach relevant page)? ___ Yes ___No. If yes,

1. Which rare species are known to occur within the Priority or Estimated Habitat (contact: Environmental Review, Natural Heritage and Endangered Species Program, Route 135, Westborough, MA 01581, allowing 30 days for receipt of information):
2. Have you surveyed the site for rare species? ___ Yes ___ No; if yes, please include the results of your survey.
3. If your project is within Estimated Habitat, have you filed a Notice of Intent or received an Order of Conditions for this project? ___ Yes ___ No; if yes, did you send a copy of the Notice of Intent to the Natural Heritage and Endangered Species Program, in accordance with the Wetlands Protection Act regulations? ___ Yes ___ No

B. Will the project "take" an endangered, threatened, and/or species of special concern in accordance with M.G.L. c.131A (see also 321 CMR 10.04)? ___ Yes ___ No; if yes, describe:

C. Will the project alter "significant habitat" as designated by the Massachusetts Division of Fisheries and Wildlife in accordance with M.G.L. c.131A (see also 321 CMR 10.30)? ___ Yes ___ No; if yes, describe:

D. Describe the project's other impacts on rare species including indirect impacts (for example, stormwater runoff into a wetland known to contain rare species or lighting impacts on rare moth habitat): No other impacts on rare species.

WETLANDS, WATERWAYS, AND TIDELANDS SECTION

I. Thresholds / Permits

A. Will the project meet or exceed any review thresholds related to **wetlands, waterways, and tidelands** (see 301 CMR 11.03(3))? ___ Yes _**X**_ No; if yes, specify, in quantitative terms:

B. Does the project require any state permits (or a local Order of Conditions) related to **wetlands, waterways, or tidelands**? _**X**_ Yes ___ No; if yes, specify which permit: Boston Conservation Commission Order of Conditions

C. If you answered "No" to both questions A and B, proceed to the **Water Supply Section**. If you answered "Yes" to either question A or question B, fill out the remainder of the Wetlands, Waterways, and Tidelands Section below.

II. Wetlands Impacts and Permits

A. Describe any wetland resource areas currently existing on the project site and indicate them on the site plan: **Work is proposed within 100 feet of the coastal bank. In addition, an existing outfall for stormwater will be repaired and upgraded.**

B. Estimate the extent and type of impact that the project will have on wetland resources, and indicate whether the impacts are temporary or permanent:

Coastal Wetlands	**Area (in square feet) or Length (in linear feet)**
Land Under the Ocean	0
Designated Port Areas	0
Coastal Beaches	0
Coastal Dunes	0
Barrier Beaches	0
Coastal Banks (stone rip-rap)	**approximately 10 – 12 linear feet for outfall repair**
Rocky Intertidal Shores	0
Salt Marshes	0
Land Under Salt Ponds	0
Land Containing Shellfish	0
Fish Runs	0
Land Subject to Coastal Storm Flowage	0

Inland Wetlands	
Bank	
Bordering Vegetated Wetlands	
Land under Water	
Isolated Land Subject to Flooding	
Bordering Land Subject to Flooding	
Riverfront Area	

C. Is any part of the project

1. a limited project? ___ Yes _**X**_ No
2. the construction or alteration of a dam? ___ Yes _**X**_ No; if yes, describe:
3. fill or structure in a velocity zone or regulatory floodway? ___ Yes _**X**_ No
4. dredging or disposal of dredged material? ___ Yes _X_ No; if yes, describe the volume of dredged material and the proposed disposal site: depends on outfall
5. a discharge to Outstanding Resource Waters? ___ Yes _**X**_ No
6. subject to a wetlands restriction order? ___ Yes _**X**_ No; if yes, identify the area (in square feet):

D. Does the project require a new or amended Order of Conditions under the Wetlands Protection Act (M.G.L. c.131A)? _**X**_ Yes ___ No; if yes, has a Notice of Intent been filed or a local Order of Conditions issued? ___ Yes _**X**_ No; if yes, list the date and DEP file number:_____. Was the Order of Conditions appealed? ___ Yes ___ No. Will the project require a variance from the Wetlands regulations? ___ Yes _**X**__ No.

E. Will the project:

1. be subject to a local wetlands ordinance or bylaw? ___ Yes _**X**_ No
2. alter any federally-protected wetlands not regulated under state or local law? ___ Yes _**X**_ No; if yes, what is the area (in s.f.)?

F. Describe the project's other impacts on wetlands (including new shading of wetland areas or removal of tree canopy from forested wetlands): **Stormwater runoff quality will be improved**. **Stone rip-rap will be repaired around the existing outfall on the coastal bank.**

III. Waterways and Tidelands Impacts and Permits

A. Is any part of the project site waterways or tidelands (including filled former tidelands) that are subject to the Waterways Act, M.G.L.c.91? _**X** __ Yes _ _ No; if yes, is there a current Chapter 91 license or permit affecting the project site? ___ Yes __**X** _ No; if yes, list the date and number: **This parcel is filled former tidelands within the Airport Boundary and is subject to exemption at 310 CMR 9.03(3)b.**

B. Does the project require a new or modified license under M.G.L.c.91? ___ Yes _**X**_ No; if yes, how many acres of the project site subject to M.G.L.c.91 will be for non-water dependent use?
Current ___ Change ___ Total ___

C. Is any part of the project

1. a roadway, bridge, or utility line to or on a barrier beach? ___ Yes __**X**___ No; if yes, describe:
2. dredging or disposal of dredged material? ___ Yes _**X**_ No; if yes, volume of dredged material _____ Depends on outfall.
3. a solid fill, pile-supported, or bottom-anchored structure in flowed tidelands or other waterways? ___ Yes _**X**_ No; if yes, what is the base area? _____
4. within a Designated Port Area? _____Yes _**X**__ No

D. Describe the project's other impacts on waterways and tidelands:

Stormwater runoff quality will be improved.

IV. Consistency:

A. Is the project located within the Coastal Zone? _X__ Yes ___ No; if yes, describe the project's consistency with policies of the Office of Coastal Zone Management: **The project site is within the coastal zone as well as being within the boundary of Logan International Airport. Repairs to the existing outfall will comply with the performance standards of the Army Corps of Engineers Section 404 General Permit Category 1. The project will improve the quality of stormwater runoff to Wood Island Marsh. Additional discussion of the project's consistency with CZM policies is found in the ENF Supplement section 6**.

B. Is the project located within an area subject to a Municipal Harbor Plan? ___ Yes _**X**_ No; if yes, identify the Municipal Harbor Plan and describe the project's consistency with that plan:

WATER SUPPLY SECTION

I. Thresholds / Permits

A. Will the project meet or exceed any review thresholds related to **water supply** (see 301 CMR 11.03(4))? ___ Yes _**X**_ No; if yes, specify, in quantitative terms:

B. Does the project require any state permits related to **water supply**? ___ Yes _**X**_ No; if yes, specify which permit:

C. If you answered "No" to both questions A and B, proceed to the **Wastewater Section**. If you answered "Yes" to either question A or question B, fill out the remainder of the Water Supply Section below.

II. Impacts and Permits

A. Describe, in gallons/day, the volume and source of water use for existing and proposed activities at the project site:

	Existing	Change	Total
Withdrawal from groundwater	_____	_____	_____
Withdrawal from surface water	_____	_____	_____
Interbasin transfer	_____	_____	_____
Municipal or regional water supply	_____	_____	_____

B. If the source is a municipal or regional supply, has the municipality or region indicated that there is adequate capacity in the system to accommodate the project? ___ Yes ___ No

C. If the project involves a new or expanded withdrawal from a groundwater or surface water source,
1. have you submitted a permit application? __ Yes ___ No; if yes, attach the application
2. have you conducted a pump test? ___ Yes __ No; if yes, attach the pump test report

D. What is the currently permitted withdrawal at the proposed water supply source (in gallons/day)? _____Will the project require an increase in that withdrawal?___ Yes __ No

E. Does the project site currently contain a water supply well, a drinking water treatment facility, water main, or other water supply facility, or will the project involve construction of a new facility? ___ Yes ___ No. If yes, describe existing and proposed water supply facilities at the project site:

	Existing	Change	Total
Water supply well(s) (capacity, in gpd)	_____	_____	_____
Drinking water treatment plant (capacity, in gpd)	_____	_____	_____
Water mains (length, in miles)	_____	_____	_____

F. If the project involves any interbasin transfer of water, which basins are involved, what is the direction of the transfer, and is the interbasin transfer existing or proposed?

G. Does the project involve
1. new water service by a state agency to a municipality or water district? ___ Yes ___ No
2. a Watershed Protection Act variance? ___ Yes ___ No; if yes, how many acres of alteration?
3. a non-bridged stream crossing 1,000 or less feet upstream of a public surface drinking water supply for purpose of forest harvesting activities? ___ Yes ___ No

H. Describe the project's other impacts (including indirect impacts) on water resources, quality, facilities and services:

III. Consistency -- Describe the project's consistency with water conservation plans or other plans to enhance water resources, quality, facilities and services:

WASTEWATER SECTION

I. Thresholds / Permits

A. Will the project meet or exceed any review thresholds related to **wastewater** (see 301 CMR 11.03(5))? ___ Yes _**X**__ No; if yes, specify, in quantitative terms:

B. Does the project require any state permits related to **wastewater**? __**X**__Yes ____ No; if yes, specify which permit: **MWRA Sewer Use Discharge Permit**

C. If you answered "No" to both questions A and B, proceed to the **Transportation -- Traffic Generation Section**. If you answered "Yes" to either question A or question B, fill out the remainder of the Wastewater Section below.

II. Impacts and Permits

A. Describe, in gallons/day, the volume and disposal of wastewater generation for existing and proposed activities at the project site (calculate according to 310 CMR 15.00):

	Existing	Change	Total
Discharge to groundwater (Title 5)	_____	_____	_____
Discharge to groundwater (non-Title 5)	_____	_____	_____
Discharge to outstanding resource water	_____	_____	_____
Discharge to surface water	_____	_____	_____
Municipal or regional wastewater facility	0	5,500 GPD	5,500 GPD
TOTAL	_____	5,500 GPD	5,500 GPD

B. Is there sufficient capacity in the existing collection system to accommodate the project? _**X**___ Yes ___ No; if no, describe where capacity will be found:

C. Is there sufficient existing capacity at the proposed wastewater disposal facility?_**X** __ Yes ___ No; if no, describe how capacity will be increased:

D. Does the project site currently contain a wastewater treatment facility, sewer main, or other wastewater disposal facility, or will the project involve construction of a new facility? ___Yes __**X** _ No. If yes, describe as follows:

	Existing	Change	Total
Wastewater treatment plant (capacity, in gpd)	_____	_____	_____
Sewer mains (length, in miles)	_____	_____	_____
Title 5 systems (capacity, in gpd)	_____	_____	_____

E. If the project involves any interbasin transfer of wastewater, which basins are involved, what is the direction of the transfer, and is the interbasin transfer existing or proposed?

F. Does the project involve new sewer service by an Agency of the Commonwealth to a municipality or sewer district? ___ Yes _**X** __ No

G. Is there any current or proposed facility at the project site for the storage, treatment, processing, combustion or disposal of sewage sludge, sludge ash, grit, screenings, or other sewage residual materials? ___ Yes __**X** _ No; if yes, what is the capacity (in tons per day):

	Existing	Change	Total
Storage	_____	_____	_____
Treatment, processing	_____	_____	_____
Combustion	_____	_____	_____
Disposal	_____	_____	_____

H. Describe the project's other impacts (including indirect impacts) on wastewater generation and treatment facilities:

III. Consistency -- Describe measures that the proponent will take to comply with federal, state, regional, and local plans and policies related to wastewater management:

Wash-water recycling equipment will allow reuse of approximately 70% of the bus wash water, thereby reducing wastewater discharges and conserving water. Wastewater will be pretreated prior to discharge to the sanitary sewer system.

A. If the project requires a sewer extension permit, is that extension included in a comprehensive wastewater management plan? ___ Yes ___ No; if yes, indicate the EOEA number for the plan and describe the relationship of the project to the plan

TRANSPORTATION -- TRAFFIC GENERATION SECTION

I. Thresholds / Permits

A. Will the project meet or exceed any review thresholds related to **traffic generation** (see 301 CMR 11.03(6))? ___ Yes _**X**__ No; if yes, specify, in quantitative terms:

B. Does the project require any state permits related to **state-controlled roadways**? ___ Yes _**X**_ No; if yes, specify which permit:

C. If you answered "No" to both questions A and B, proceed to the **Roadways and Other Transportation Facilities Section**. If you answered "Yes" to either question A or question B, fill out the remainder of the Traffic Generation Section below.

II. Traffic Impacts and Permits

A. Describe existing and proposed vehicular traffic generated by activities at the project site:

	Existing	Change	Total
Number of parking spaces	_____	_____	_____
Number of vehicle trips per day	_____	_____	_____
ITE Land Use Code(s):			

B. What is the estimated average daily traffic on roadways serving the site?

Roadway	Existing	Change	Total
1. _____	_____	_____	_____
2. _____	_____	_____	_____
3. _____	_____	_____	_____

C. Describe how the project will affect transit, pedestrian and bicycle transportation facilities and services:

III. Consistency -- Describe measures that the proponent will take to comply with municipal, regional, state, and federal plans and policies related to traffic, transit, pedestrian and bicycle transportation facilities and services:

ROADWAYS AND OTHER TRANSPORTATION FACILITIES SECTION

I. Thresholds

A. Will the project meet or exceed any review thresholds related to **roadways or other transportation facilities** (see 301 CMR 11.03(6))? ___ Yes _**X**_ No; if yes, specify, in quantitative terms:

B. Does the project require any state permits related to **roadways or other transportation facilities**?
___ Yes _**X**_ No; if yes, specify which permit:

C. If you answered "No" to both questions A and B, proceed to the **Energy Section**. If you answered "Yes" to either question A or question B, fill out the remainder of the Roadways Section below.

II. Transportation Facility Impacts

A. Describe existing and proposed transportation facilities at the project site:

	Existing	Change	Total
Length (in linear feet) of new or widened roadway	_____	_____	_____
Width (in feet) of new or widened roadway	_____	_____	_____

Other transportation facilities:

B. Will the project involve any
1. Alteration of bank or terrain (in linear feet)? _____
2. Cutting of living public shade trees (number)? _____
3. Elimination of stone wall (in linear feet)? _____

III. Consistency -- Describe the project's consistency with other federal, state, regional, and local plans and policies related to traffic, transit, pedestrian and bicycle transportation facilities and services, including consistency with the applicable regional transportation plan and the Transportation Improvements Plan (TIP), the State Bicycle Plan, and the State Pedestrian Plan:

ENERGY SECTION

I. Thresholds / Permits

A. Will the project meet or exceed any review thresholds related to **energy** (see 301 CMR 11.03(7))? ___ Yes _**X**_ No; if yes, specify, in quantitative terms:

B. Does the project require any state permits related to **energy**? ___ Yes _**X**_ No; if yes, specify which permit:

C. If you answered "No" to both questions A and B, proceed to the **Air Quality Section**. If you answered "Yes" to either question A or question B, fill out the remainder of the Energy Section below.

II. Impacts and Permits

A. Describe existing and proposed energy generation and transmission facilities at the project site:

	Existing	Change	Total
Capacity of electric generating facility (megawatts)	_____	_____	_____
Length of fuel line (in miles)	_____	_____	_____
Length of transmission lines (in miles)	_____	_____	_____
Capacity of transmission lines (in kilovolts)	_____	_____	_____

B. If the project involves construction or expansion of an electric generating facility, what are
1. the facility's current and proposed fuel source(s)?
2. the facility's current and proposed cooling source(s)?

C. If the project involves construction of an electrical transmission line, will it be located on a new, unused, or abandoned right of way?___ Yes ___ No; if yes, please describe:

D. Describe the project's other impacts on energy facilities and services:

III. Consistency -- Describe the project's consistency with state, municipal, regional, and federal plans and policies for enhancing energy facilities and services:

AIR QUALITY SECTION

I. Thresholds

A. Will the project meet or exceed any review thresholds related to **air quality** (see 301 CMR 11.03(8))? ___ Yes __**X**_ No; if yes, specify, in quantitative terms:

B. Does the project require any state permits related to **air quality**? **_ X __** Yes ___ No; if yes, specify which permit:

Certification is required for the emergency generator under the DEP Environmental Results Program (ERP)

C. If you answered "No" to both questions A and B, proceed to the **Solid and Hazardous Waste Section**. If you answered "Yes" to either question A or question B, fill out the remainder of the Air Quality Section below.

II. Impacts and Permits

A. Does the project involve construction or modification of a major stationary source (see 310 CMR 7.00, Appendix A)?___ Yes _**X**_ No; if yes, describe existing and proposed emissions (in tons per day) of:

	Existing	Change	Total
Particulate matter	_____	_____	_____
Carbon monoxide	_____	_____	_____
Sulfur dioxide	_____	_____	_____
Volatile organic compounds	_____	_____	_____
Oxides of nitrogen	_____	_____	_____
Lead	_____	_____	_____
Any hazardous air pollutant	_____	_____	_____
Carbon dioxide	_____	_____	_____

B. Describe the project's other impacts on air resources and air quality, including noise impacts:
No other impacts on air quality are anticipated as part of the Green Bus Depot.

Future noise sources from the Green Bus Depot are anticipated to be well below existing noise sources such as the MBTA Blue Line. The Green Bus Depot would include several integrated design features that maximize noise reduction including low-noise diesel-electric hybrid buses, building layout and design to shield exterior activities, maintenance activities limited to interior spaces with closed doors, forward-flow layout that minimizes back-up alarms, and staggered roof heights to block rooftop HVAC mechanical units. Refer to Chapter 2, Existing Conditions and Site Context, of this ENF for further details on noise impacts.

III. Consistency

A. Describe the project's consistency with the State Implementation Plan:
The Green Bus Depot is not specifically included in the SIP; however, it will house the Unified Bus Fleet to be implemented as part of the Consolidated Rental Car (ConRAC) facility which is consistent with the SIP.

B. Describe measures that the proponent will take to comply with other federal, state, regional, and local plans and policies related to air resources and air quality:
Consistency with the Clean Air Act (CAA) General Conformity Rule will be demonstrated by showing that the operational emissions are below the applicable *de minimus* levels of the CAA General Conformity Rule. The emergency generator will comply with DEP emissions, operational and stack height requirements prescribed under the MA DEP Environmental Results Program

(ERP). **The project will be consistent with the Logan Air Quality Initiative, Logan Parking Freeze, Massport Construction Program and the Massachusetts and Massport Climate Change Programs.**

SOLID AND HAZARDOUS WASTE SECTION

I. Thresholds / Permits

A. Will the project meet or exceed any review thresholds related to **solid or hazardous waste** (see 301 CMR 11.03(9))? ____ Yes **_X_**_ No; if yes, specify, in quantitative terms:

B. Does the project require any state permits related to **solid and hazardous waste**? ___Yes **X_** No; if yes, specify which permit:

C. If you answered "No" to both questions A and B, proceed to the **Historical and Archaeological Resources Section**. If you answered "Yes" to either question A or question B, fill out the remainder of the Solid and Hazardous Waste Section below.

II. Impacts and Permits

A. Is there any current or proposed facility at the project site for the storage, treatment, processing, combustion or disposal of solid waste? __ Yes ___ No; if yes, what is the volume (in tons per day) of the capacity:

	Existing	Change	Total
Storage	_____	_____	_____
Treatment, processing	_____	_____	_____
Combustion	_____	_____	_____
Disposal	_____	_____	_____

B. Is there any current or proposed facility at the project site for the storage, recycling, treatment or disposal of hazardous waste? __ Yes ___ No; if yes, what is the volume (in tons or gallons per day) of the capacity:

	Existing	Change	Total
Storage	_____	_____	_____
Recycling	_____	_____ __	_____
Treatment	_____	_____	_____
Disposal	_____	_____	_____

C. If the project will generate solid waste (for example, during demolition or construction), describe alternatives considered for re-use, recycling, and disposal:

Solid waste removal and disposal will be performed under the applicable DEP Guidance on Construction Demolition Debris. This may occur concurrently with any MCP activities, if required.

D. If the project involves demolition, do any buildings to be demolished contain asbestos? N/A
___ Yes ___ No

E. Describe the project's other solid and hazardous waste impacts (including indirect impacts):

III. Consistency--Describe measures that the proponent will take to comply with the State Solid Waste Master Plan:

HISTORICAL AND ARCHAEOLOGICAL RESOURCES SECTION

I. Thresholds/Impacts

A. Is any part of the project site a historic structure, or a structure within a historic district, in either case listed in the State Register of Historic Places or the Inventory of Historic and Archaeological Assets of the

of such historic structure? ___ Yes ___ No; if yes, please describe:

B. Is any part of the project site an archaeological site listed in the State Register of Historic Places or the Inventory of Historic and Archaeological Assets of the Commonwealth? ___ Yes _X_ No; if yes, does the project involve the destruction of all or any part of such archaeological site? ___ Yes ___ No; if yes, please describe:

C. If you answered "No" to all parts of both questions A and B, proceed to the **Attachments and Certifications** Sections. If you answered "Yes" to any part of either question A or question B, fill out the remainder of the Historical and Archaeological Resources Section below.

D. Have you consulted with the Massachusetts Historical Commission? ___ Yes ___ No; if yes, attach correspondence

E. Describe and assess the project's other impacts, direct and indirect, on listed or inventoried historical and archaeological resources:

II. Consistency -- Describe measures that the proponent will take to comply with federal, state, regional, and local plans and policies related to preserving historical and archaeological resources:

ATTACHMENTS:

1. Plan, at an appropriate scale, of existing conditions of the project site and its immediate context, showing all known structures, roadways and parking lots, rail rights-of-way, wetlands and water bodies, wooded areas, farmland, steep slopes, public open spaces, and major utilities.
2. Plan of proposed conditions upon completion of project (if construction of the project is proposed to be phased, there should be a site plan showing conditions upon the completion of each phase).
3. **Original** U.S.G.S. map or good quality **color** copy (8-½ x 11 inches or larger) indicating the project location and boundaries
4. List of all agencies and persons to whom the proponent circulated the ENF, in accordance with 301 CMR 11.16(2).
5. Other:

CERTIFICATIONS:

1. The Public Notice of Environmental Review has been/will be published in the following newspapers in accordance with 301 CMR 11.15(1):

East Boston Times — July 21, 2010

Boston Herald — July 19, 2010

2. This form has been circulated to Agencies and Persons in accordance with 301 CMR 11.16(2).

7.15.10 — Thomas W. Ennis — Joanne Haracz

Date — Signature of Responsible Officer or Proponent — Date — Signature of person preparing ENF (if different from above)

Name (print or type) Thomas W. Ennis	Name (print or type) Joanne Haracz. AICP
Firm/Agency Massport	Firm/Agency AECOM
Street One Harborside Drive, Suite 200S	Street 66 Long Wharf
Municipality/State/Zip East Boston, MA 02128	Municipality/State/Zip Boston, MA 02110
Phone 617.568.1090	Phone 617.371.4495

Boston-Logan International Airport
Green Bus Depot Project

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SITE LOCUS
Figure 1

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Boston-Logan International Airport
Green Bus Depot Project
Environmental Notification Form Supplement

1.0 Project Background and Description

The proposed Green Bus Depot will provide Massport with the necessary on-airport facilities to maintain a new fleet of clean-fuel shuttle buses replacing its aging fleet of CNG shuttle buses, and also allow Massport to accommodate the new Unified Bus System, comprised of diesel-electric hybrid shuttle buses, that will serve Logan's new Consolidated Rental Car Facility (EEA # 14137). By constructing the Green Bus Depot on-airport, Massport will be able to shift more airport activity out of the community into this state-of-the-art facility. The new facility has been designed to minimize operational impacts to the adjacent neighborhoods, with particular focus on air quality and noise during periods when airport and MBTA activity is off-peak.

The Green Bus Depot will be constructed to Leadership in Energy and Environmental Design (LEED) and Massachusetts LEED Plus standards, with a goal of achieving LEED Silver certification through a series of site design, energy efficiency, emissions reduction, noise abatement and water quality measures. In addition to the LEED measures, the Green Bus Depot will also be designed with operational flexibility to embrace new clean-fuel and low-emitting bus technologies, as they become available.

Logan's new bus fleet will be comprised of 32 sixty-foot articulated clean diesel-electric hybrid buses, and 18 forty-foot or forty-two foot compressed natural gas (CNG) buses. The new fleet will be significantly more fuel efficient, have lower emissions and be quieter than the fleet currently in operation. As noted above, through implementation of the Consolidated Rental Car Facility project in Logan's Southwest Service Area (EEA # 14137), a new Unified Bus Fleet, with fewer than half the number of buses currently serving the existing rental car companies, will fully replace the existing rental car diesel bus fleet. While this alone results in a significant environmental benefit, unless the Green Bus Depot is established on-airport, the entire Massport bus fleet, including the Unified Bus Fleet, will be required to travel along local roads through East Boston and Chelsea for daily maintenance and overnight storage.

By eliminating bus trips on local streets in East Boston and Chelsea neighborhoods, the project will improve traffic in congested Day Square and other local roads and reduce off-airport bus noise and emissions.

The Green Bus Depot will occupy a 7.7 acre restricted-access site adjacent to the MBTA's Blue Line tracks in Logan Airport's North Service Area (NSA). (See Figure 2) The facility would include approximately 72,810 square feet of enclosed structures. The proposed structures, 13-15 employee parking spaces, and the site vehicular and pedestrian circulation, will cover approximately five acres. The building program, other than fueling components, has been organized into a single facility. The functional parts of the building were organized on the site with the quieter, larger components – bus parking – located closest to the adjoining residential neighborhood to the north (which is separated from the Green Bus Depot by the MBTA tracks), and the noisier bus maintenance components to the south. Wash-water recycling equipment will allow reuse of approximately 70% of the wash water.

Bus circulation around the site will move in a counter-clockwise direction, minimizing travel movements. The maintenance bays are designed as drive-through bays, eliminating noise from backup alarms. The majority of bus operations will be shielded from the community by the proposed building and landscaping along the MBTA tracks. The continuous 'sound barrier' wall that encloses the north face of the building,

in conjunction with the continuous berm planted with a double row of evergreen trees along the MBTA right-of-way, will minimize the transmission of sounds from the facility to the neighborhood. The development will significantly increase green space in this portion of the airport by creating a landscaped edge along the MBTA tracks, and vegetated detention basins and bioswale for stormwater control and enhancement adjacent to Wood Island Marsh.

Access into the Green Bus Depot site would be via existing airport roadways. The ultra low sulfur diesel fueling and storage (two – below grade 10,000 gallon tanks) for the diesel-electric hybrid buses will be located on the southwest portion of the site near the site entrance and away from the neighborhood properties. The planned facility and its associated program elements would offer significant environmental benefits including:

- Reduced impact of bus traffic on the East Boston community and neighborhoods in Chelsea.
- Incorporation of sustainable design elements in the building construction and operations.
- Construction of a significant new landscape edge at the property line screening the Neptune Circle and Swift Terrace neighborhoods and the North Service Area section of Logan Airport.
- Provision of transit, pedestrian and bicycle access for employees.
- Improvements in the quality and reduction in the quantity of stormwater runoff to Wood Island Marsh.

Project Description

The new Green Bus Depot will centralize the storage and maintenance of Massport's buses while making significant efforts to mitigate its impact on the surrounding neighborhood. Among other initiatives, the project offers the following environmental and operational benefits:

- It maximizes efficiency by using the smallest possible building footprint within a modest site boundary, thereby limiting building materials and total paved surface.
- By maintaining a low profile with a maximum height of 24 feet, the building remains in scale with neighboring homes and nearby airport support buildings. To limit the building's visibility, the site features extensive plantings along its neighborhood edges.
- A landscape edge consisting of a double row of evergreen trees along the MBTA Blue Line tracks will provide a natural and attractive separation between the Green Bus Depot and the adjacent neighbors to screen the facility from the neighborhoods both visually and with respect to sound. The landscape elements will be complementary to the plantings proposed on the adjacent Bus/Limo Pool site and will improve and enhance the site area which is currently an unvegetated gravel area.
- The building arrangement locates the quietest elements closest to neighboring homes and further shields those homes with a noise-mitigating sound wall. An earthen berm will be constructed along the northern edge of the site to further dampen sound levels. To minimize sounds from the building's operations, most rooftop equipment will be installed on the lowest roof, away from nearby neighborhoods. The higher roof of the bus storage structure will shield the neighborhood from the rooftop equipment.

- The site circulation is designed for efficient one-way bus travel in order to limit unnecessary movements and to curtail bus back-up alarms.

- Low-height, low-cutoff light fixtures will limit light emittance from the building and site.

- On-site detention basins and bio-swales will enhance the quality of stormwater runoff. The site employs permeable materials where possible; and systems will be put in place for the drainage, filtration and treatment of stormwater.

- Recycling equipment will allow reuse of approximately 70% of bus wash water; the remainder will be discharged to the sanitary sewer.

- Efforts to maintain and improve air quality are in place: Massport's new fleet of diesel-electric hybrid and compressed natural gas (CNG) buses are more efficient, reduce emissions and are much quieter.

- The project will incorporate sustainable design and construction practices in accordance with the "Massachusetts LEED Plus" standard and is pursuing LEED accreditation with a goal of achieving LEED Silver by incorporating such elements as low-voltage light fixtures, limited on-site parking and enhancing employee access to public transportation, daylighting in work areas, the planting of native-species trees that do not require irrigation, a high-albedo roof, and a building orientation that reduces solar gain.

- The objective is to design an attractive building that functions well, with limited visibility from the community.

The proposed Green Bus Depot would include 72,810 square feet of enclosed structures. The structures, together with the associated 13-15 employee parking spaces and the site vehicular and pedestrian circulation, will cover approximately five acres. The balance of the developed parcel would include a landscape edge along the MBTA tracks and a landscaped area along the waterfront that incorporates the stormwater detention basins and bio-swale. Access into the Green Bus Depot site would be via the existing roadway system.

The proposed Massport Green Bus Depot would have space dedicated to:

- Administration: office, work areas, and staff support spaces for personnel administering the operations of Massport's bus fleet;

- Transportation: supervisory office, drivers' lounge, and restroom/locker facilities for personnel operating the bus fleet;

- Building Support: mechanical, electrical, telecom, IT and other facilities support spaces;

- Maintenance: repair bays, workshops, parts storage, supervisory office, restroom/locker/shower facilities, and support spaces for maintenance personnel;

- Bus Service: fueling, bus washing and interior cleaning functions;

- Bus Parking: enclosed/heated parking space for a portion of the bus fleet that is for early morning start-ups, and a covered structure for storage of the remainder of the bus fleet; and

massport

MPA GREEN BUS DEPOT
LOGAN INTERNATIONAL AIRPORT
EAST BOSTON, MASSACHUSETTS

SITE LOCUS AERIAL BASE

N

FIG. 2

AECOM

- Employee parking and pedestrian circulation, fuel storage, waste/recyclable storage/disposal, bicycle parking, and bus site circulation.

The building program, other than fueling components, has been organized into a single facility. Bus circulation around the site moves in a counter-clockwise direction, minimizing travel movements. The majority of bus operations are shielded from the community by the evergreen landscape edge along the MBTA tracks, and the building itself. The ultra low sulfur diesel fueling and storage (two – below grade 10,000 gallon below ground tanks) are located near the site entrance and away from the neighborhood properties.

The functional parts of the building were organized on the site with the quieter, larger components –bus parking – closest to the adjoining neighborhood to the north. The noisier bus maintenance components will be located to the south away from the neighborhood. Administration, transportation, maintenance support and building support functions are located centrally, in the smallest of the four building blocks – a low single-story structure placed between the maintenance bay block and the Bus Barn. The building is 'L-shaped' to fit within the triangular site geometry. (See Figure 3)

The maintenance bays are all drive-through bays, so that very few, if any backing maneuvers are required, making this a quieter facility by avoiding the noise of backup alarms. This is also a safety feature because it avoids the blind spots that occur when backing in bus maneuvering areas.

The bus wash facility is aligned with the bus maintenance bays and is part of the same building mass eliminating water, power, and gas utility runs to a separate building. A 4-brush industrial bus wash system will be located here, with wash-water recycling equipment that will allow reuse of approximately 70% of the wash water; the remainder will be discharged to the sanitary sewer.

The bus parking area immediately to the north of the Administrative functions is a fully-enclosed building containing parking bays for up to 20 articulated buses (or about 25 standard buses). The enclosed bus "barn" will provide heated conditioned space for easy winter starts, and an enclosed all-weather environment for interior cleaning of buses. Automatic motorized overhead doors will be provided at both ends of this building.

The remaining buses will be stored in the bus parking area at the north edge of the site, designed as a covered bus "shed" with a roof and a continuous 'sound barrier' wall enclosing the north face of the building, with open ends on the east and west sides. It provides parking bays for up to 25 articulated buses (or about 35 standard buses). This building is connected to the bus garage by a covered bus access way, allowing by-pass circulation of buses exiting the site, or re-circulating from fueling or maintenance areas. The continuous 'sound barrier' wall that encloses the north face of the building, in conjunction with the continuous raised berm, planting, and trees along the MBTA right-of-way, will minimize the transmission of sounds from the facility to the neighborhood.

Daylighting of interior spaces will be accomplished through the use of transparent panels within the overhead doors in the storage and maintenance areas, or with prefabricated bubble-type skylights at roof areas to minimize the need for electrical lighting. The flat roof areas themselves will be membrane-type roofing pitched to interior drains and overflow scuppers, and will be white or light colored to maximize solar reflectance.

See Figure 4 for a Proposed Site Layout and Figures 5 and 6 for renderings of the proposed facility.

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MPA GREEN BUS DEPOT

LOGAN INTERNATIONAL AIRPORT
EAST BOSTON, MASSACHUSETTS

BUILDING DIAGRAM

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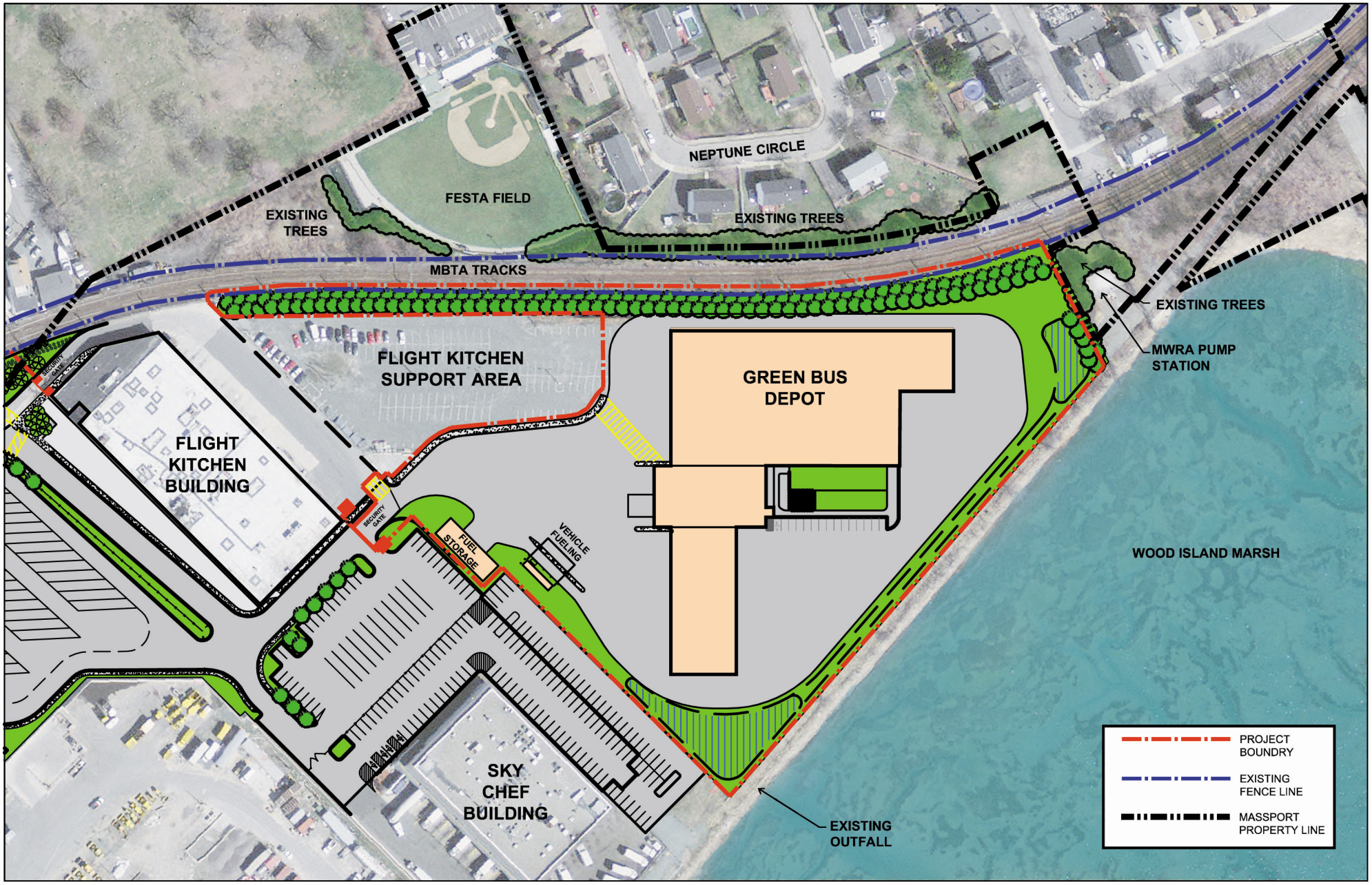
FIG. 3

AECOM



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CONCEPTUAL SITE PLAN

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FIG. 4

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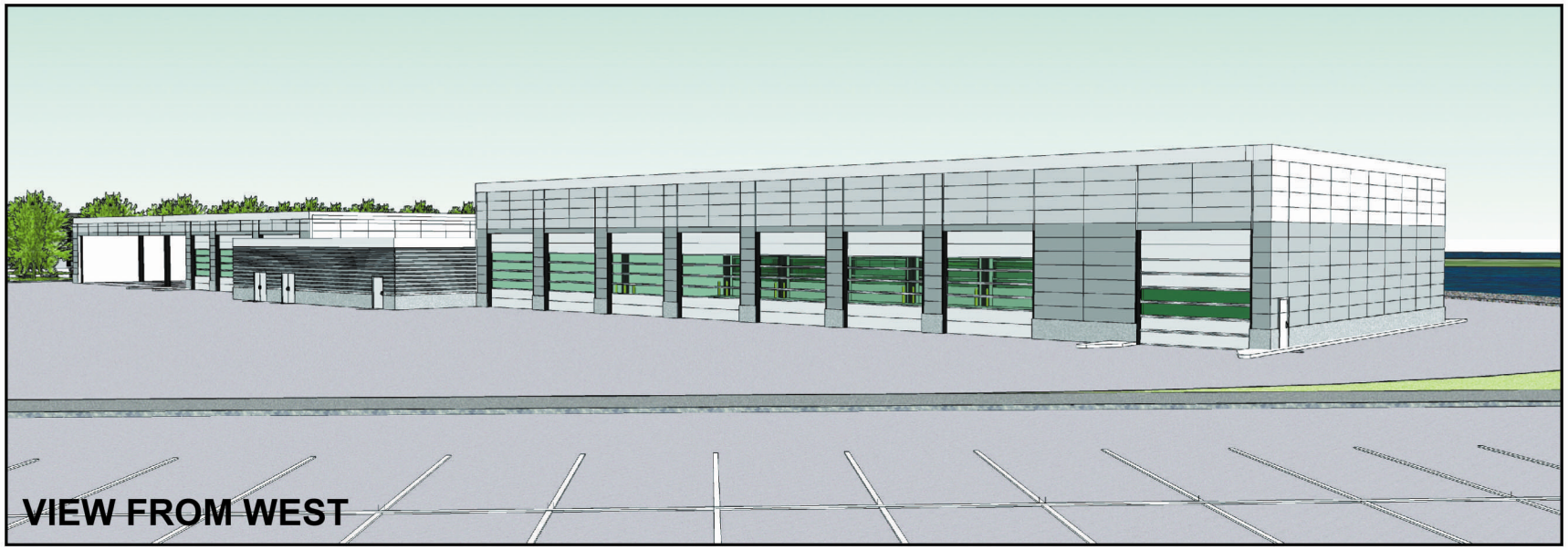

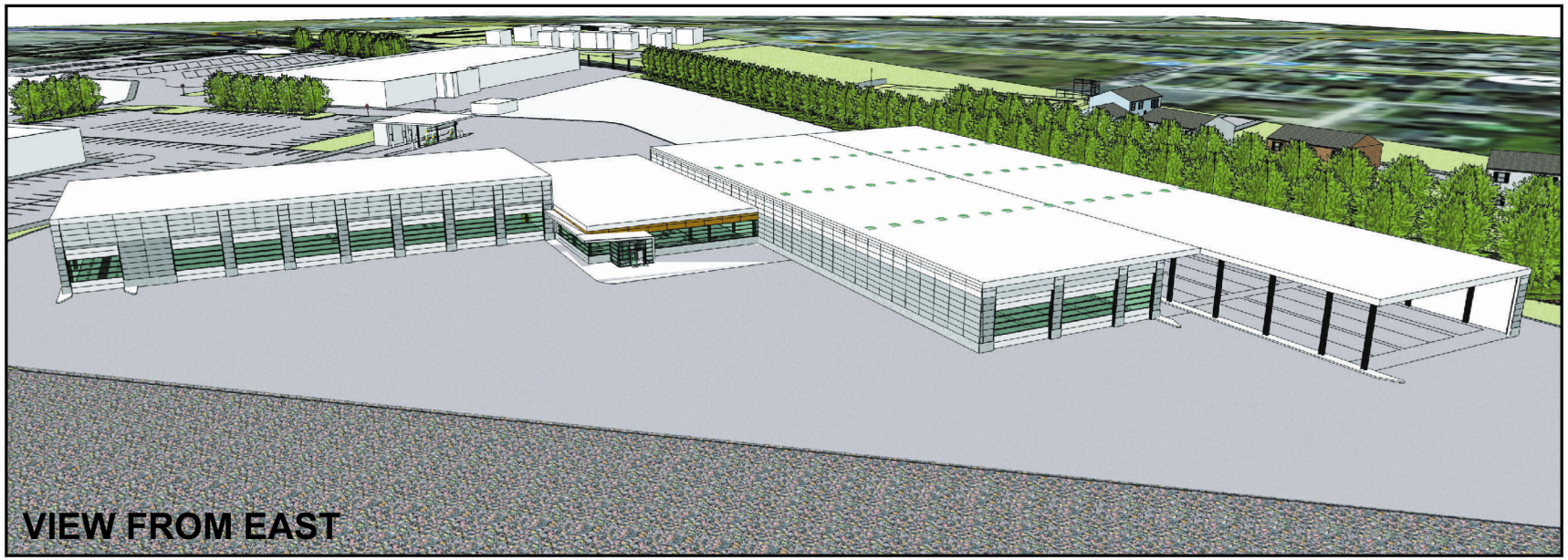

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MODEL VIEWS

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FIG. 5

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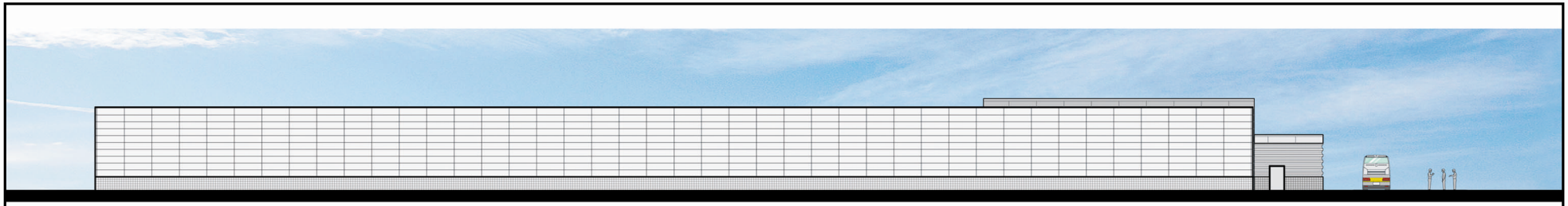
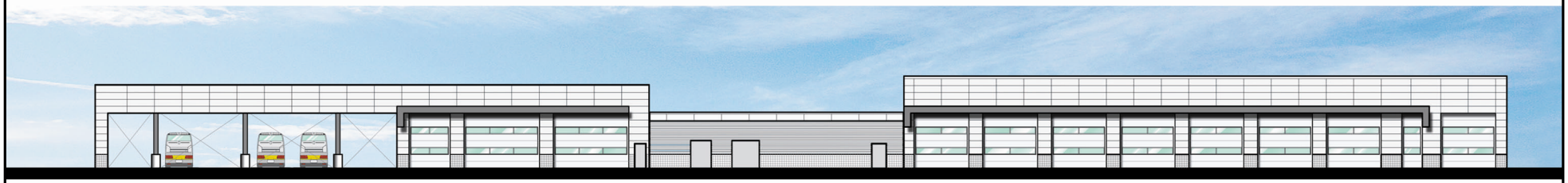


NORTH ELEVATION

EAST ELEVATION

SOUTH ELEVATION



WEST ELEVATION

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ELEVATION STUDY

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FIG. 6

AECOM

Key features of the proposed Green Bus Depot design include:

- The site and building layout minimizes the impact on the adjacent community by locating the noisier operations away from the neighborhood and shielding these operations with the building mass itself.

- The site and building layout maximizes efficiency by using a small building footprint within a modest site boundary, thereby limiting building materials and total paved surface.

- The architecture of the building will maintain a low profile in order for the building to remain in scale with the neighborhood and nearby existing airport support buildings. Architectural features such as a noise-mitigating sound wall and low shielded roofs, where HVAC equipment will be primarily consolidated, so as to utilize the higher building masses to mitigate noise impact to neighbors.

- The site and building layout allows for one way, forward moving bus circulation, reducing backing movements and their alarms. (See Figure 7)

- The incorporation of sustainable design principles in the design, construction and operational aspects of the facility, including water efficiency, energy efficiency, resource conservation and indoor environmental quality. The project will also incorporate sustainable site features such as encouraging the use of alternative transportation for employees, the reduction of stormwater runoff and the use of appropriate materials and the design of controlled site lighting.

- The Massport Green Bus Depot project intends to pursue LEED 2009 Certification through the US Green Building Council/Green Building Certification Institute (USGBC/GBCI) including specific achievement of MA LEED Plus standards, with LEED Silver Certification if achievable. (See Section 3 for additional detail)

- A climate tempered enclosed bus storage barn that will be used for early morning bus start-ups.

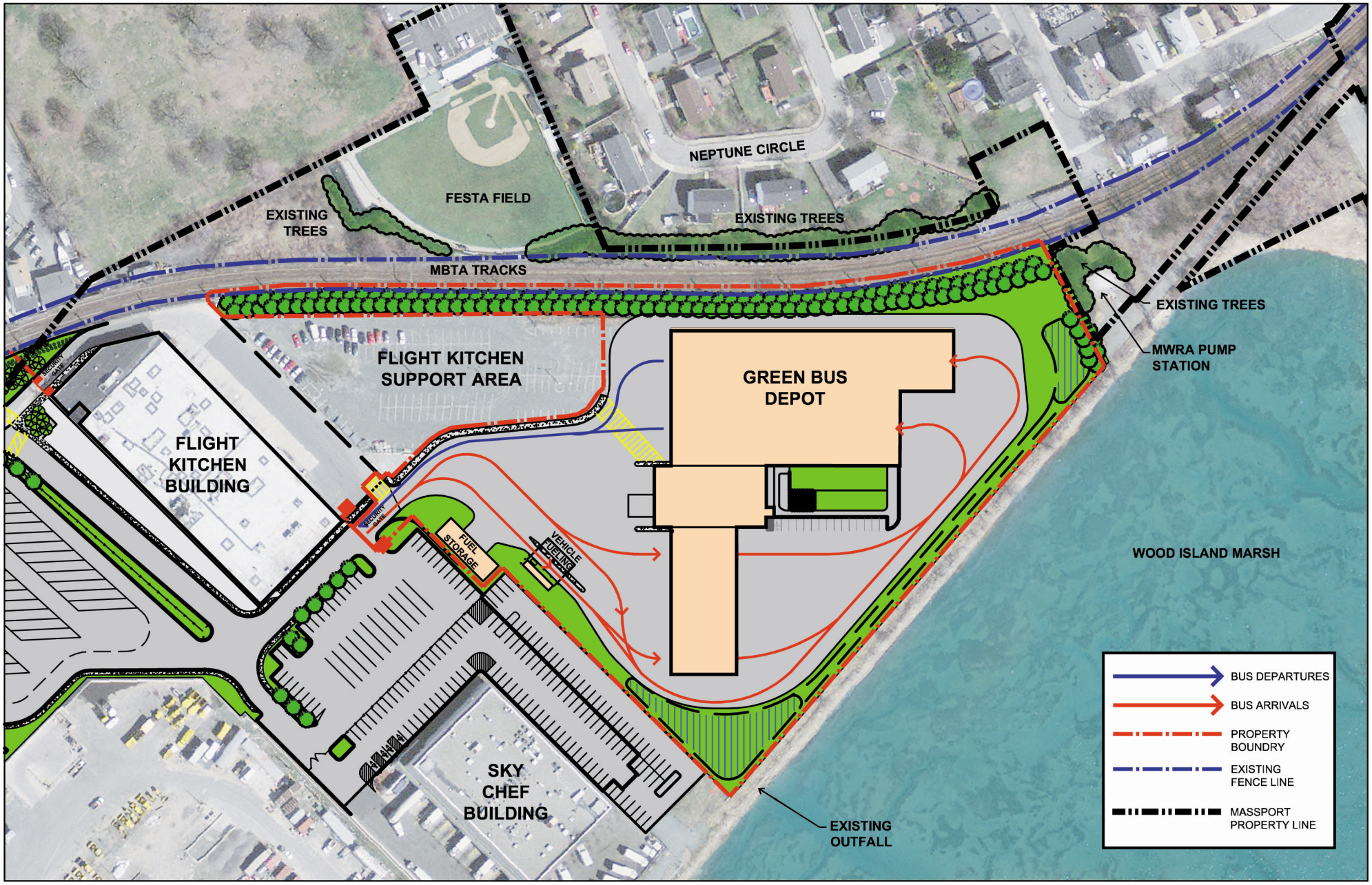
- The ability to service a new “cleaner” bus fleet operating at the Airport comprised of diesel-electric hybrid and CNG buses. The new fleet will be more energy efficient, have lower emissions and be quieter than the fleet currently in operation.

- The on-airport maintenance facility will remove significant bus trips that currently travel to Chelsea where the current fleet is serviced. This elimination of bus trips through local streets in East Boston and Chelsea will reduce noise and improve air quality in the East Boston and Chelsea neighborhoods.

- Landscape features are incorporated to visually screen the neighbors from the facility. To limit the building’s visibility, the site features extensive evergreen plantings along its edge nearest the community. Further dampening the ambient noise, an earth berm impacts the neighbors.

2.0 Existing Conditions and Site Context

The project site is a 7.7 acre triangular parcel of land located in the North Service Area of Logan Airport. It is bordered by the MBTA Blue Line tracks, Boston Harbor/Wood Island Marsh, and existing buildings housing Logan flight kitchens. (See Figure 8) The project area is generally flat.



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CIRCULATION STUDY

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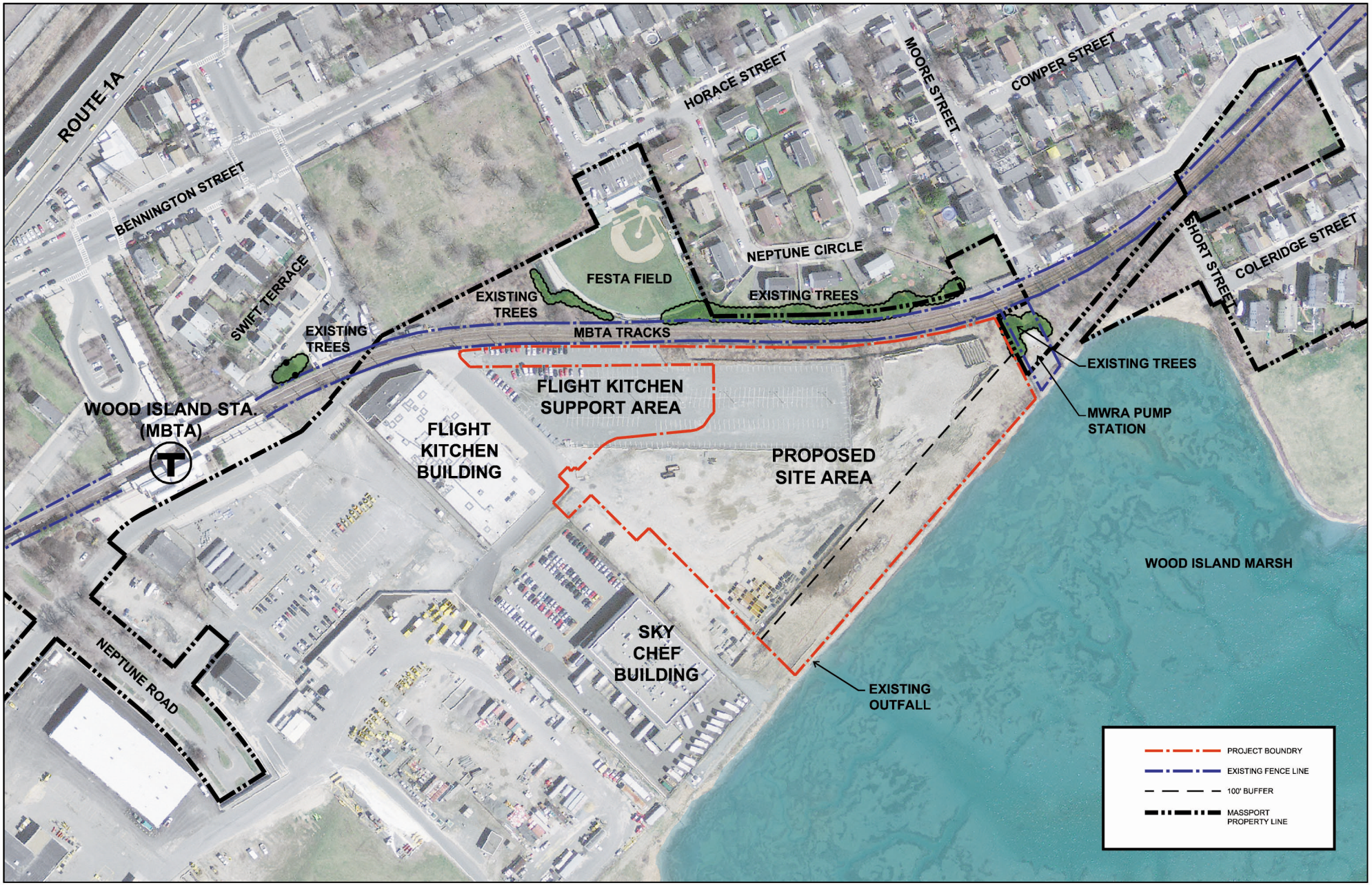
FIG. 7

AECOM



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EXISTING SITE PLAN

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FIG. 8

AECOM

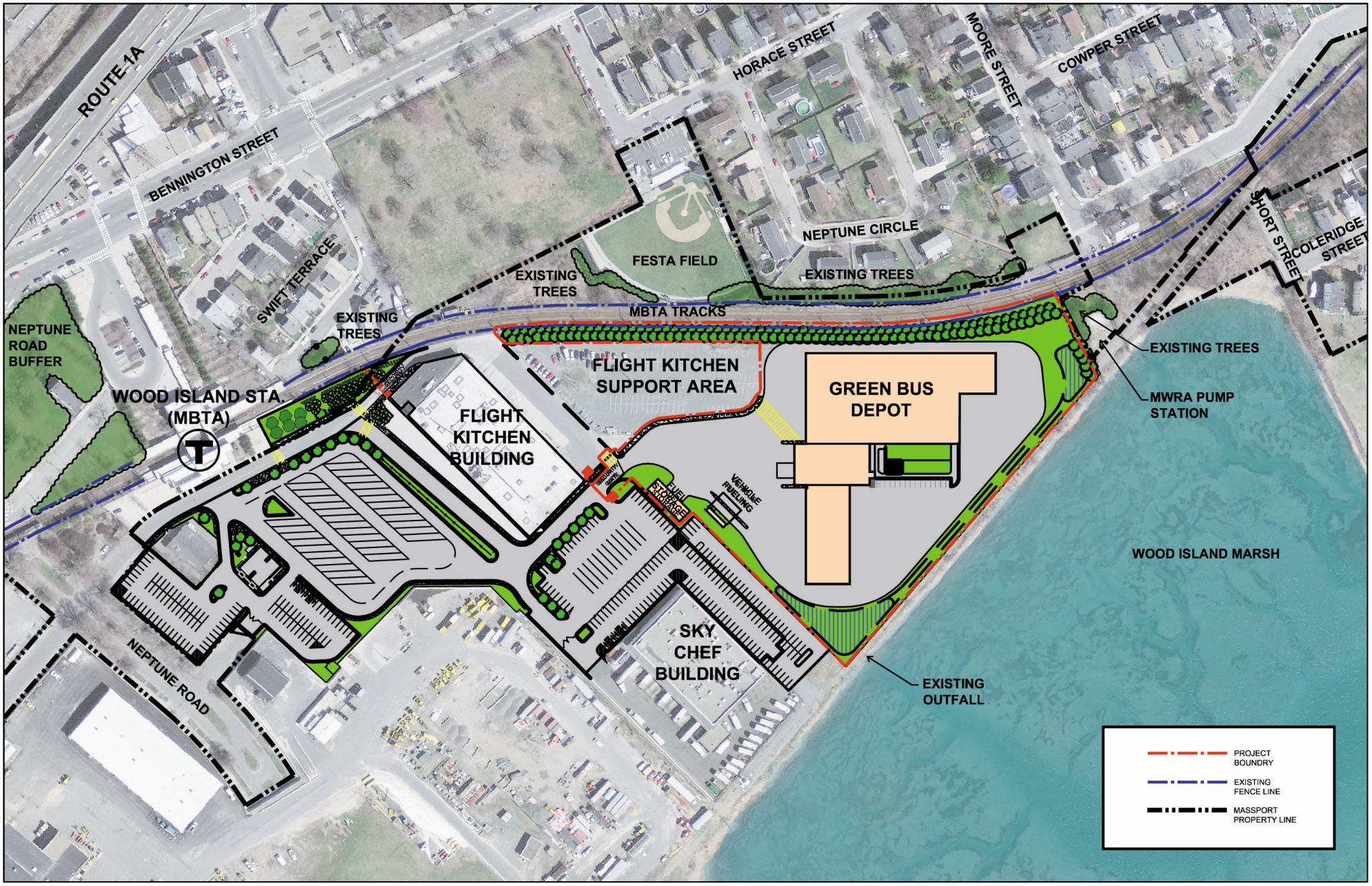
The project site is mostly covered by gravel and is unvegetated except for the 100 foot strip adjacent to the marsh. The project site is currently and has historically been used for a range of aviation support activities including vehicle and equipment storage, overflow parking, and construction staging. The southern edge of the site abuts marshland.

The main access point is located on the western edge of the site, between the existing flight kitchen buildings. The area to the west of the project site and the flight kitchen buildings will be used temporarily by Logan's Taxi and Limo Pools while the Southwest Service Area Redevelopment Project (EEA # 14137) is under construction. The Taxi and Limo Pools will return to the Southwest Service Area (SWSA) following the completion of the SWSA Redevelopment Project.

The North Service Area ("NSA") is one of Logan Airport's four aviation support areas and includes the following important airport businesses and operations: navigation equipment essential to the operations of the adjacent RW 15/33; a major airport electrical substation; in-flight kitchen services; ground maintenance facilities; and multi-purpose areas that over time have been used for bus staging and storage, overflow commercial parking, construction staging and equipment storage. Approximately one half of the NSA lies within RW 15/33's Runway Protection Zone ("RPZ"). Ground level-activity and facility development within these areas must comply with the FAA's RPZ restrictions and guidelines. The runway Part 77 Surfaces within these areas limit the height of structures and trees.

The approximately forty-two (42) acre NSA is located in Logan Airport's northwest corner and generally is bordered on the east by the Wood Island Marsh, on the south by airside (specifically the 10,000-foot long RW 15/33 zone), on the north and west by the MBTA Blue Line tracks and the Wood Island MBTA Station. Across the tracks from the NSA are the East Boston neighborhoods of Swift Terrace and Neptune Circle. An isolated segment of the City of Boston-owned Neptune Road, bisected by the MBTA Blue Line tracks, also is located within the NSA. On the opposite side of the Blue Line tracks is an important NSA airport service road that serves as a secondary airport entrance/exit that intersects with Neptune Road, Vienna Street and Route 1A. Massport plans to incorporate several parcels (approximately three and one half acres) that are located adjacent to the NSA service road into an airport edge buffer to be known as the Neptune Road Buffer. The Neptune Road Buffer will be a landscaped pathway system that will be designed in consultation with the neighborhood. Massport expects to begin the formal community planning process for the Neptune Road Buffer in fall 2010.

Because of the proximity of portions of the NSA to the Swift Terrace and Neptune Circle neighborhoods, Massport plans to install an attractive landscape screen along the portion of the NSA that lies adjacent to the MBTA Blue Line tracks. (See Figure 9) This landscape screen is intended to visually buffer airport operations from the nearby neighbor's residences. Massport recently discussed with neighbors its plans to proceed with development of the NSA including the temporary bus/limo pool, the existing flight kitchens, and the proposed Green Bus Depot; Massport will design and construct the landscape screen in conjunction with these new developments. The landscaped screen is envisioned as a heavily-planted linear edge, approximately twenty-five feet wide, with a berm (approximately two feet high) adjacent to the MBTA Blue Line tracks. The primary plant materials to be planted will be a double row of six-foot tall Austrian Pine evergreen trees with a base of hardy shrubs and/or perennial groundcovers appropriate for the site.



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EAST BOSTON, MASSACHUSETTS

OVERALL CONTEXT PLAN

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FIG. 9

AECOM

3.0 Sustainability Measures

The Massport Green Bus Depot project will incorporate sustainable design and construction practices, in accordance with the Massport Sustainable Design Standards and Guidelines, and the Commonwealth's "Massachusetts LEED Plus" standard. The project intends to pursue LEED 2009 Certification through the US Green Building Council/Green Building Certification Institute (USGBC/GBCI), with a project goal of attaining the LEED "Silver" level of Certification. The following sustainable approaches will be pursued as the project progresses into design and construction phases:

- **Sustainable Sites:** The site location meets the criteria for the LEED credit point "Alternative Transportation: Public Transit Access", as well as the Massachusetts LEED Plus Standard "Smart Growth" development criteria, due to its proximity to the Wood Island MBTA Station. Sidewalks will be provided to enhance access by transit users and pedestrians, and bike racks will be provided for building users. Only a minimum number of parking spaces will be provided to encourage alternative transportation, and several priority parking spaces will be reserved for low-emitting vehicles. Stormwater design will comply with stringent MA DEP standards for both quantity and quality. Light colored roofing materials will be used to minimize the urban "heat island" effect. Exterior lighting will be designed to meet "Dark Sky" standards, minimizing nighttime light, particularly for nearby residences. During construction, erosion control measures such as hay bales, silt fences and storm drain inlet filters will be established and maintained to prevent air and water pollution from construction activities, in compliance with federal EPA and Massachusetts DEP regulations.

- **Water Efficiency:** Plumbing fixtures will be specified to provide at least a 20 percent water use reduction, in accordance with the Massachusetts LEED Plus Standard and the LEED 2009 Water Efficiency Prerequisite. Landscape design will incorporate drought-tolerant species to encourage water-efficient landscaping. The Bus Wash system will incorporate water reclamation to reduce water usage.

- **Energy Efficiency:** The project will comply with the new 2010 MA Energy Conservation Code, with a goal of providing energy performance improvements 20 percent beyond these stringent requirements, in accordance with the Massachusetts LEED Plus Standard. The building envelope, mechanical equipment, lighting and controls systems for the Administrative Offices, Bus Maintenance, Bus Storage areas will be designed and detailed to achieve these energy performance improvements. The feasibility of incorporating on-site renewable energy (solar thermal or photovoltaics) will be investigated during design, with a goal of providing at least 3% of the building energy needs through on-site generation, if the project budget allows. At the end of construction, all major project mechanical, electrical and specialty systems will be subject to a rigorous commissioning process, to ensure that all systems are operating as designed and providing the expected system performance and efficiency.

- **Resource Conservation:** Materials used in the building construction will be specified to include the use of recycled and regionally sourced materials. Wood products used in the permanent building construction will be from Forest Stewardship Council (FSC) certified sources. During construction, the building contractor will prepare and execute a plan for managing construction and demolition (C&D) waste to maximize the amount re-used, recycled, and diverted from landfills.

- **Indoor Environmental Quality:** In accordance with state regulations and LEED requirements, no smoking will be allowed inside the building or anywhere outside the building within 25' of any exterior doors, windows or air intakes. Construction materials will be specified to minimize

volatile organic compounds (VOCs) and other indoor air pollutants; entry mat systems will be installed at each building entrance to capture dust and other particulates; ventilation and exhaust systems will be designed to isolate indoor sources of pollution such as chemical storage areas. The building design will incorporate natural daylight and exterior views to enhance the indoor environment for building users, both in administrative office areas and in the bus maintenance work areas. During construction, the building contractor will prepare and execute a plan to ensure high levels of Indoor Air Quality when the construction is complete, eliminating sources of mold, dust and residual chemical compounds.

- **Sustainable Design Innovations:** There are several sustainable design innovations related specifically to the project location and building type. The Green Bus Depot has been sited to minimize bus miles driven between the bus routes and the bus storage/maintenance location, reducing greenhouse gas emissions and taking buses off of the local streets. The specific bus types were selected after an extensive analysis of fuel options to provide energy efficient and low-emitting fleet. The site design has been developed to minimize bus queuing and engine idling.

4.0 Consistency with Prior Planning

The proposed project complies with previous planning initiatives for the area, including the Logan and East Boston parking freezes and the Logan Environmental Data Reports.

Logan Airport and East Boston Parking Freezes

Several parking freezes were enacted in the Boston area as a means of helping reduce vehicle emissions. The number of parking spaces at Logan Airport is regulated by the Logan Airport Parking Freeze,[1] first implemented in 1973 as part of the State Implementation Plan (SIP) under the Clean Air Act (CAA).[2] The Logan Parking Freeze originally set the limit at 19,315 commercial and employee parking spaces. After the Three-Way Land Transfer (ParkEx) in 2001 and associated buy-out provision,[3] an additional 1,337 commercial parking spaces were purchased by Massport and transferred from the East Boston Freeze Zone to the Logan Airport Freeze Zone, establishing the current Logan limit as 20,692 spaces.

A total of 13-15 employee parking spaces will be relocated to the Green Bus Depot from the employee parking pool. These spaces would be part of the total allocated spaces to Massport (20,962) and would not result in the creation of new parking spaces.

Logan Airport Environmental Data Report (EDR)

The Logan Environmental Data Report (EDR) provides an annual assessment of environmental conditions and summarizes the status of planning for each of the airport's service areas. The 2008 EDR described the work done for a proposed Economy Parking Consolidation project that was previously under consideration for the North Service Area[4] and noted that the site was instead being considered for the Green Bus Depot maintenance facility analyzed in this Environmental Notification Form (ENF).

[1] 310 CMR 7.30.

[2] The SIP outlines near- and long-term strategies to bring air quality in Massachusetts into compliance with National Ambient Air Quality Standards (NAAQS).

[3] EOEA #12216.

[4] As originally envisioned, the Economy Parking Consolidation project would have redeveloped three parcels in the North Service Area totaling ±15.7 acres, into a combined economy parking facility with the capacity for up to 1,750 vehicles. That project was the subject of an ENF in 2005 (EEA No 13456) and is no longer under consideration. Massport will construct two parking decks over

New Landscape Screening

Massport recently discussed with neighbors its plans to proceed with development of the NSA into a unified campus for important airport businesses including the temporary bus/limo pool, the existing flight kitchens, and the proposed Green Bus Depot. Massport will design and construct the neighborhood landscape screen in conjunction with these new developments. The landscaped screen is envisioned as a heavily planted linear edge, approximately twenty-five feet wide, with a berm adjacent to the MBTA Blue Line tracks. The primary plant materials will be evergreen trees with a base of hardy shrubs and/or perennial groundcovers appropriate for the site. While the plantings will serve as a screen between the Green Bus Deport and the neighborhood, this is not a substitute, but rather an addition to the Neptune Road Airport Edge Buffer.

5.0 Alternatives to the Project

Under a No-Build Alternative, the Massport bus fleet would continue to be maintained off-airport. The existing fleet is maintained at a privately owned facility on Eastern Avenue in Chelsea. This alternative was dropped from further consideration as it would not provide for a modern, state-of-the art facility that would allow Massport to shift airport activity out of the community on to the airport. Because the Massport shuttle bus fleet is expanding to serve the new ConRAC facility, the No-Build Alternative would have resulted in an increase in the buses continuing to travel through East Boston and Chelsea to reach the maintenance facility for service and overnight storage.

The Build Alternative would provide a facility in the North Service Area to service and store the Massport bus fleet on-airport, thereby eliminating Massport buses traveling on local roads through East Boston and Chelsea, except for the buses servicing the employee parking garage in Chelsea.

Various design options were considered for the facility. Site layouts included schemes built out along the northern edge of the site parallel to the MBTA tracks and schemes oriented toward the marshland edge of the site. Facility layouts included options for a single large structure, as well as a series of smaller buildings arranged on the site. The primary concerns guiding the development of the concept designs included community impacts (noise, air quality visual, etc.) and facility operations. Through further review and refinement, the “Preferred Alternative” was chosen which is the subject of this ENF.

The Preferred Alternative provides an optimal layout for operations while at the same time address concerns of noise and visual impacts on the nearby neighborhoods. The building is laid out such that the noisier activities (maintenance, fuel, wash) will be located away from the neighborhood side of the site. The building itself screens these activities from the neighborhood. The use of ‘drive-through’ maintenance bays minimizes the use of back-up alarms and promotes a safer facility by avoiding the blind spots that occur when backing up in bus maneuvering areas. The building is organized into four separate blocks of function yet they are one connected building. The ‘L-shaped’ organization of the building plan fits within the triangular site geometry with its setbacks, while providing adequate maneuvering space for 40-42 foot standard and 60-foot articulated buses, which circulate around the site in a counter-clockwise direction, minimizing travel movements. Site constraints – size and geometry – also figure heavily in the decision to organize the building program into the four connected blocks.

The positioning of the building on the site allows an adequate area along the north border to provide a vegetated landscape buffer with a berm between the new building and the MBTA and neighborhood. An

the existing economy parking on the former Robie Parcel that will consolidate commercial parking on-airport, providing parking for nearly 3,000 vehicles on this site. Consolidation of parking would not create any new commercial parking spaces beyond that which currently exist and are allowed under the Logan Airport Parking Freeze.

area also exists along the waterfront to be used partially as a stormwater detention area. The vegetation selected will be hardy, fast growing, and complement the existing neighboring vegetation, to provide a visual buffer from the operations and lighting on the site.

6.0 Assessment of Impacts and Potential Mitigation

6.1 Transportation and Parking

Impacts to airport-wide and off-airport traffic and transportation and transportation operations are expected to be beneficial. Massport will be purchasing a new bus fleet that will be more energy efficient, have lower emissions and be quieter than the fleet currently in operation. The proposed Green Bus Depot will replace and consolidate shuttle bus service facilities - including administrative and transportation offices, maintenance and servicing facilities, and bus parking - that currently exists off-airport. This will result in a reduction of vehicle miles travelled (VMT) as well as an improvement in air quality from a reduction in emissions along the existing bus route through East Boston and Chelsea. (See Figure 10)

Development of a new bus maintenance facility on airport in the North Service Area would provide congestion relief and improve traffic conditions to the following Chelsea and East Boston neighborhood roadways and intersections:

- Eastern Avenue, Chelsea
- Eastern Avenue and Central Avenue/Chelsea Street, Chelsea
- Chelsea Street and Curtis Street, East Boston
- Chelsea Street and Neptune Road and Saratoga Street, East Boston
- Neptune Road and Bennington Street, East Boston
- Neptune Road and Route 1A ramps.

Figure 10 provides a comparison of the existing bus route to the Chelsea maintenance facility and the route to the proposed Green Bus Depot in the NSA.

Site Access and Circulation

Access to the Green Bus Depot site would be via the existing airport roadway network. Bus circulation is designed in a counter-clockwise loop around the site. Since the bus fleet will include a combination of 40-42 foot CNG buses and 60-foot diesel-electric hybrid articulated buses, the circulation design requirements have been based on accommodation of both types of buses. The majority of the bus operations will be shielded from the community by the landscape screen along the MBTA tracks and the maintenance building itself.

MPA GREEN BUS DEPOT
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BUS ROUTE COMPARISON

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FIG. 10

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Site Trip Generation

Green Bus Depot trip generation is shown in Table 1. The following assumptions have been made in calculating the project's generated vehicle trips:

- In-service bus trips include existing routes at current scheduling, and Unified Bus System (ConRAC) buses at scheduling/volume as described in the *Southwest Service Area (SWSA) Redevelopment Program Final Environmental Impact Report (EEA #14137)*.

- Distribution of in-service bus trips assumes all routes begin and end at airport terminals.

- "Employee Trips" include driver trips and assume a daily administrative/maintenance staff of 10 persons, plus a 4-person cleaning crew.

- "Maintenance Trips" include 2-4 trips per hour from 5:00 am to 11:00 pm, associated with maintenance (parts delivery, vehicle testing, service calls, etc.).

- There is no CNG fueling at this site. All CNG fueling will be done at the existing CNG airport station. Only ultra low sulfur diesel fuel will be dispensed at this site. "Other Green Bus Depot (GBD) Trips" include 2-4 trips per hour from 6:00 am to 9:00 pm, for miscellaneous errands, vendors, training, etc. Distribution of "Other Green Bus Depot Trips" is based on existing patterns at Frankfort Street/Lovell Street intersection traffic volumes.

As shown in Table 1, the total number of daily trips generated by the project site is estimated at 340 (170 in, 170 out) vehicles. The morning peak hour (8:00 am to 9:00 am) and evening peak hour (19:00 pm to 20:00 pm) trips are estimated at 20 and 21 vehicles, respectively. The site peak hour of traffic - 26 vehicles - occurs between 1:00 am and 2:00 am. This is due to the majority of buses returning to the site at the end of their shift.

Traffic Impacts

Buses will access/egress the site via the existing roadway network. Upon leaving the site, buses will use Lovell Street, turn left at the intersection with Frankfort Street, and travel approximately 400 feet to reach Service Road on their way to the airport. Returning to the site from the airport, the buses will use Service Road, Frankfort Street, and Lovell Street. The maximum number of buses that would travel through the Lovell Street/Frankfort Street intersection during any given hour is 20, which occurs between the hours of 1:00 am and 2:00 am, when traffic volumes on the local roadways and intersections is fairly low.

Relocation of bus maintenance activities from the existing location on Eastern Avenue in Chelsea to the North Service Area would permanently remove these buses from the local roadways and intersections. The following locations are some of the major intersections that would benefit from the relocation:

- Eastern Avenue, Chelsea

- Eastern Avenue and Central Avenue/Chelsea Street, Chelsea

- Chelsea Street and Curtis Street, East Boston

Table 1: Green Bus Depot Trip Generation

Time	Total Daily Trips			Subtotal Buses		Subtotal Other Vehicles		MPA Buses		Unified Shuttle ConRAC Buses		ConRAC Driver Trips		Maintenance Trips		Employee Trips		Other GBD Trips		Other CNG Fueling	
	IN	OUT	ALL	IN	OUT	IN	OUT	IN	OUT	IN	OUT	IN	OUT	IN	OUT	IN	OUT	IN	OUT	IN	OUT
0:00:00	5	3	8	2	0	3	3	1	0	1	0	1	1	0	0	2	2	0	0	0	0
1:00:00	17	9	26	14	6	3	3	8	4	6	2	3	3	0	0	0	0	0	0	0	0
2:00:00	1	0	1	1	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0
3:00:00	0	3	3	0	3	0	0	0	3	0	0	0	0	0	0	0	0	0	0	0	0
4:00:00	0	11	11	0	7	0	4	0	5	0	2	0	0	0	0	0	4	0	0	0	0
5:00:00	3	12	15	0	9	3	3	0	3	0	6	0	0	1	1	0	0	0	0	2	2
6:00:00	8	4	12	2	0	6	4	2	0	0	0	0	0	1	1	2	0	1	1	2	2
7:00:00	7	9	16	1	3	6	4	1	0	0	3	0	0	1	1	0	0	1	1	4	4
8:00:00	13	7	20	0	0	13	7	0	0	0	0	0	0	2	2	8	2	1	1	2	2
9:00:00	7	9	16	0	2	7	7	0	0	0	2	0	0	2	2	0	0	1	1	4	4
10:00:00	8	6	14	0	0	8	6	0	0	0	0	0	0	2	2	2	0	2	2	2	2
11:00:00	6	11	17	0	5	6	6	0	3	0	2	0	0	2	2	0	0	2	2	2	2
12:00:00	8	8	16	0	0	8	8	0	0	0	0	0	0	2	2	0	0	2	2	4	4
13:00:00	8	9	17	0	1	8	8	0	0	0	1	0	0	2	2	0	0	2	2	4	4
14:00:00	7	11	18	0	2	7	9	0	0	0	2	0	0	2	2	0	2	1	1	4	4
15:00:00	7	8	15	0	1	7	7	0	0	0	1	0	0	2	2	0	0	1	1	4	4
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17:00:00	11	7	18	4	0	7	7	1	0	3	0	2	2	2	2	0	0	1	1	2	2
18:00:00	5	6	11	1	0	4	6	1	0	0	0	0	0	1	1	0	2	1	1	2	2
19:00:00	14	7	21	7	0	7	7	1	0	6	0	3	3	1	1	0	0	1	1	2	2
20:00:00	8	4	12	0	0	8	4	0	0	0	0	0	0	1	1	4	0	1	1	2	2
21:00:00	5	4	9	1	0	4	4	1	0	0	0	0	0	1	1	0	0	1	1	2	2
22:00:00	11	6	17	5	0	6	6	0	0	5	0	3	3	1	1	0	0	0	0	2	2
23:00:00	4	3	7	1	0	3	3	1	0	0	0	0	0	1	1	0	0	0	0	2	2
	170	**170**	**340**	**39**	**39**	**131**	**131**	**18**	**18**	**21**	**21**	**12**	**12**	**29**	**29**	**20**	**20**	**20**	**20**	**50**	**50**

- Chelsea Street and Neptune Road and Saratoga Street, East Boston
- Neptune Road and Bennington Street, East Boston
- Neptune Road and Route 1A ramps.

Removing buses from these intersections will provide a benefit to the community by reducing noise and emissions associated with existing bus operations in East Boston and Chelsea, as well as reduce traffic congestion.

6.2 Wetland Resources

The majority of the site is currently covered with gravel and unvegetated. A coastal salt marsh (Wood Island Marsh) dominated by saltmarsh cordgrass (*Spartina alterniflora)* is located to the east of the project site. There is a rip-rap bulkhead running along the eastern edge of the parcel, which forms the coastal bank in this area. A 36-inch outfall structure (Northwest outfall) currently permitted under Massport's existing NPDES permit is located in this area. With the exception of outfall maintenance the rip-rap banks will not be disturbed by the proposed construction. At the top of the rip-rap bulkhead is a vegetated band approximately 100-feet in width that is coincident with the 100-foot buffer zone associated with the coastal bank. Vegetation in the buffer zone is primarily grasses and several small trees, such as staghorn sumac, which have become established along the shoreline. The entire site is above the 100-year flood elevation of 9.5 MSL (mean sea level). There are no other state or federal jurisdictional wetland areas on the project site.

No wetlands will be altered as part of the project and runoff quality will be improved. A 50-foot wide vegetated buffer will be maintained along the Wood Island Marsh. Two stormwater detention basins and a bio-swale will be located within the vegetated buffer area. The detention basins will be designed in accordance with the performance standards of the Massachusetts Department of Environmental Protection Stormwater Management Policy. Any areas that are disturbed by the construction of the detention basins will be revegetated with low maintenance, native grasses.

The project will not involve any work in Wood Island Marsh. Based on an inspection of the existing 36-inch outfall pipe, some repair or reconstruction may be necessary. Repair of the structure would require temporary disturbance of the rip-rap coastal bank. If needed, the rip-rap will be replaced once repairs have been completed.

6.3 Stormwater Management

A key consideration in designing the stormwater management system for the project was the enhancement of the water quality discharged to Wood Island Marsh. The existing site is unpaved, and the majority of the area is covered by a packed gravel surface. The site contains stockpiles of the soil material as well as other construction materials.

The existing site has a closed drainage system (i.e contained within a pipe). The stormwater runoff from the western part of the site flows into the closed drainage system and is discharged into the marsh via a 36-inch outfall (Northwest outfall) located on the southeast side of the site. The closed drainage system within the project area also routes runoff from areas outside the project limits to the outlet. The stormwater runoff from the eastern portion of the site that is not collected in the closed drainage system flows via overland flow to both the MBTA tracks along the northern edge of the site and the marsh area along the southeastern edge.

The proposed drainage system will be designed such that the peak runoff rate for the post-development conditions does not exceed the pre-development runoff rate for the runoff leaving the site. The existing outfall pipe will be repaired and reused. Two detention basins will be constructed along the southeastern edge of the site to mitigate stormwater runoff being generated on site due to an increase in impervious area. The detention basin will be designed with a sediment forebay and extended detention to allow suspended solids to settle out, thereby improving the quality of stormwater discharging from the site. The stormwater from the western side of the site will be collected in a closed drainage system consisting of catch basins with sumps and sediment control structures. The sediment control structures will be sized to provide treatment for total suspended solids (TSS) removal in accordance with Massachusetts DEP Stormwater Management Standards. The outlets from the sediment control structures will be connected to the existing drainage system. This will allow the stormwater to be treated prior to being discharged into the tidal marsh. Further soil testing is being performed to determine the feasibility of infiltrating the runoff depending on the depth to groundwater and the permeability of the existing soils.

6.4 Wastewater Management

The vehicle wash system will incorporate a water reclamation system to reduce the water needed for vehicle washing and reduce the volume of wastewater discharged to the sewer system. Approximately 16,525 gallons of water per day will be used, of which 11,025 gallons per day will be reclaimed. The washer will utilize a combination of fresh water and reclaimed water to supply the appropriate amounts of water to the system. The reclamation system will take water collected in a sump pit, treat it through a series of cyclonic filters, and then store the water until it is needed by the washer. The water generated during the wash will flow to a trench drain that in turn flows to a large sump pit in the wash bay. The water on top of the bus is removed by means of a drag mop at the end of the wash cycle. Collected water flows to the sump pit where it is pumped to the reclamation system. During high-use periods overflow from the sump pit that is not reclaimed will flow through an oil/water separator prior to discharge to the sanitary sewer. The typical configuration of the sump pit is with the overflow invert approximately one foot below the inflow from the trench drain. This provides a natural settling basin for heavier particulates and keeps those particulates from entering the oil/water separator.

All discharge from the vehicle wash system will meet Massachusetts Water Resources Authority (MWRA) treatment standards prior to discharge to the sanitary sewer. The total wastewater generated on site is estimated to be 5,500 gallons per day, which includes the wash water that is not reclaimed as well as that generated by sanitary facilities on site.

6.5 CZM Consistency

The Green Bus Depot site in the North Service Area is located within a Coastal Zone. A summary of the project's consistency with Coastal Zone Management policies and principals is provided.

- **Water Quality** - Stormwater runoff from the project site is presently directed to an outfall that discharges to Wood Island Marsh. Most of the site is unimproved, consisting primarily of a gravel surface, with stockpiles of soil and construction materials. In the developed condition, a new stormwater management system will be installed to control runoff from the site. Together with the best management practices (BMPs) to be employed at the site, the quality of the stormwater runoff from the site will be enhanced through the use of oil/water separators and sedimentation structures. No new outfalls are proposed.

- **Habitat/Protected Areas –** The project site has been used for construction storage and staging activities. It does not contain any protected species habitat, nor does it serve as a significant

wildlife habitat. (See Appendix A for consultation letters from the Massachusetts Division of Fish and Wildlife and US Fish and Wildlife Service.) The project will provide a benefit to coastal salt marsh by improving the quality of stormwater runoff to Wood Island Marsh.

- **Coastal Hazards** – The project will not affect the site's beneficial function in terms of storm damage prevention and flood control. There will be no changes to the existing riprap coastal bulkhead that would affect its function and value.

- **Growth Management** – The site has been used for a range of airport-related uses over the past several decades, including construction staging and storage. The western boundary of the site is formed by the MBTA Blue Line corridor which separates the site from the adjacent residential community. An attractive airport landscaped screen will be constructed to visually separate the site from the community and to minimize potential lighting impacts.

- **Public Access** - The Green Bus Depot site will be secured with a fence and access will be controlled via a gate. The project will be a restricted area within the Airport boundary and thus no public access to the waterfront in the area will be allowed.

6.6 Noise

A noise assessment was conducted to document the potential impacts associated with the operation and construction of the proposed Green Bus Depot (GBD) with a particular focus on noise when airport and MBTA activity is off-peak. For purposes of this study it was conservatively assumed that no noise impacts are caused by the existing on-going use of the project site. A detailed prediction model was developed to simulate the future noise sources at the proposed GBD in the NSA, the existing terrain effects and any building reflections. Project noise sources specified in the prediction model include stationary or idling buses, on-site bus movements, bus refueling and washing, maintenance activities and rooftop ventilation fans. Bus operations data for various periods of the day are consistent with the bus trips utilized in the Consolidated Rental Car (ConRAC) Facility Study [EOEA #14137). Field measurements were also conducted at the closest residences to document the baseline noise conditions in the vicinity of the proposed GBD.

The Massport GBD will house compressed natural gas (CNG) and diesel-electric hybrid buses which are significantly quieter than comparable diesel buses while stationary and while accelerating. The results of the prediction modeling indicate that there are no significant noise impacts associated with the GBD development. By implementing several LEED® Green Building design features, future noise levels from the maintenance facility are predicted to be at or below the existing baseline levels. The design features selected to minimize the noise profile of the maintenance facility include the following elements and activities:

- The proposed site is laid out and arranged to locate the quieter elements (bus parking) closest to the neighborhood and the louder activities (such as bus maintenance and washing) farthest from the community;
- The proposed buildings would also be strategically arranged whereby the largest bus storage building (or Shed) would act as noise barrier to shield the neighborhood from the other facility activities;
- The entire facility is intended to minimize or eliminate the use of back-up alarms by operating in a one-way counter-clockwise direction so that buses flow through the refueling, washing, maintenance and storage areas without the need to back-up;
- Buses would idle onsite less than five minutes in accordance with State law (M.G.L., Chapter 90, Section 16A);
- Except for emergency repairs, all scheduled maintenance activities are intended to occur during the daytime from 7:00 AM to 5:00 PM;

- In addition to locating all maintenance activities indoors, the Maintenance Bays building would include overhead doors to further contain maintenance noise;
- The bus wash building, which would be located furthest from the neighborhood, would contain overhead doors to contain jet washing noise indoors;
- Rooftop ventilation fans would be provided with sound attenuators and would be located on the lower roof of the Administration Building so that the mechanical equipment is further shielded by the higher Bus Barn roofline;
- All employee parking would be located east of the Administration Building so that it would be shielded by the bus storage Bus Barn building;
- Sustainable landscaping (such as berms and trees) would be provided around the perimeter of the facility to further reduce noise impacts; and,
- The late night/early morning bus access route would be relocated away from Wood Island Station and the Swift Terrace neighborhood to minimize nighttime noise impacts.

As shown in Table 2, the future 24-hour day-night cumulative noise levels (L_{dn}) are the same as the Existing Conditions and are, therefore, not predicted to exceed the allowable increase criteria from the Federal Aviation Administration (FAA). Similarly, as shown in Table 3, late night peak hour noise levels at 1:00 AM (during maximum facility bus activity) are also not predicted to exceed the Massachusetts Department of Environmental Protection (DEP) criteria of 10 decibels above the measured background. The peak hour project noise levels during the 1:00-2:00 AM period are also not predicted to exceed the City of Boston Air Pollution Control Committee's (APCC) nighttime threshold of 50 decibels, which is primarily intended for stationary sources such as rooftop ventilation fans.

Table 2: Cumulative Noise Effects-FAA 24-hour Regulatory Criteria

ID	Name	Existing Conditions[1]	Future Project	Cumulative Noise Levels	Increase Over Existing	Evaluation Criteria
R1	Swift Terrace	72	45	72	0.0	1.5
R2	Neptune1	68	49	68	0.0	1.5
R3	Cowper St.	68	46	68	0.0	1.5

1 Existing noise levels were measured in March and May 2010 in the community.

Table 3: Cumulative Noise Effects - DEP Peak-Hour (1:00 AM) Regulatory Criteria

ID	Name	Existing Conditions[1]	Future Project	Evaluation Criteria
R1	Swift Terrace	46	43	56
R2	Neptune1	46	45	56
R3	Cowper St.	46	45	56

1 Existing noise levels were measured in March and May 2010 in the community.

To assess the potential for speech interference, particularly indoors, maximum instantaneous noise levels (or L_{max}) were evaluated. As shown in Table 4, L_{max} noise levels are predicted to range from 35 dBA indoors to 60 dBA outdoors at the closest residences along Neptune Circle. These levels are not predicted to exceed the Federal Interagency Committee on Aircraft Noise (FICAN) limits of 70-75 dBA outdoors or the NC30 design curve used to evaluate the potential for noise to interfere with speech.

Table 4: Single Event Noise Exposure (Speech Interference)

Receptor		Exterior (façade)[1]		Interior (bedroom)		Exterior Criteria[2]	Interior Criterion[3]
ID	Name	CNG	HYB	CNG	HYB		
R1	Swift Terrace	42	44	17	19	70-75	40
R2	Neptune Circle	58	60	33	35	70-75	40
R3	Cowper Street	52	54	27	29	70-75	40

1 The maximum reference noise levels for accelerating buses (provided by the manufacturers) ranges from 73 dBA for CNG buses to 75 dBA for diesel-electric hybrid buses at 50 feet.

2 The range of noise levels associated with speech interference as reported by the Federal Interagency Committee on Aircraft Noise (FICAN) are reproduced from the ConRAC Study. These levels are assessed outdoors with an implied impact indoors assuming open windows.

3 Interior noise thresholds to assess speech interference are based on the NC30 curve for bedrooms and other quiet rooms.

The location of the proposed bus maintenance facility, the various bus noise sources (including the bus arrival and departure routes, and idling locations), and the closest residences are shown graphically in Figure 11. The modeled sources shown in Figure 11 include the following:

- Idle upon arrival, outside Shed (Arrival Idle)
- Idle upon arrival, inside Shed (Arrival Idle, Inside)
- Idle before departure, outside Shed (Departure Idle)
- Idle before departure, inside Shed (Departure Idle, Inside)
- Idling inside the maintenance bays (Maintenance Bays)
- Idling inside the bus wash (Bus Wash)
- Idling at the refueling station (Fuel Dispense)
- Moving buses (solid lines with directional arrow)

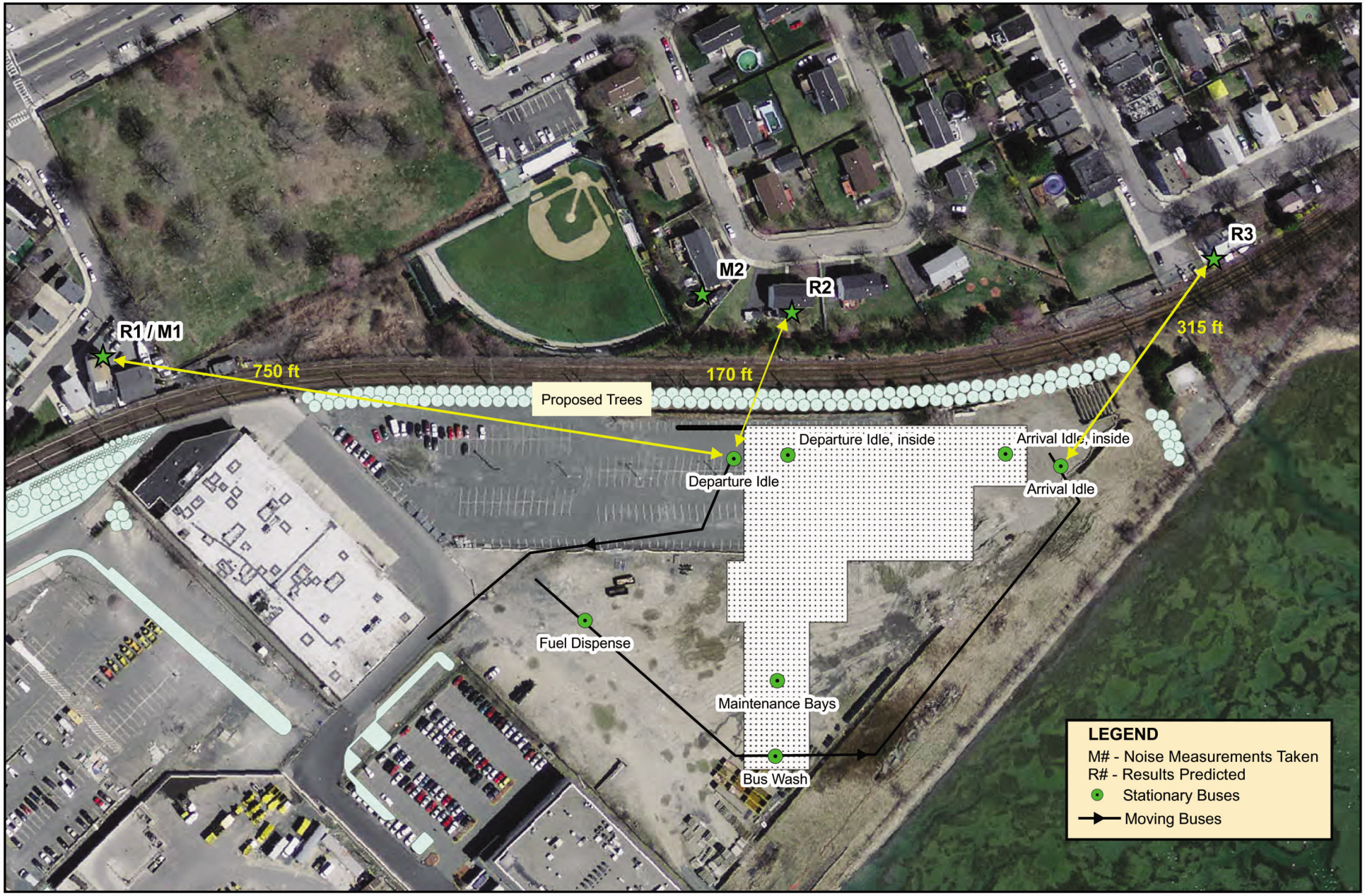
6.7 Air Quality

An air quality assessment was conducted to document the potential impacts associated with the construction and operation of Massport's proposed Green Bus Depot (GBD). The detailed air quality analysis addresses two main project-level related air quality issues:

1. Localized air quality impact around the new GBD facility through a concentration dispersion modeling assessment for the relevant localized criteria pollutants using an Environmental Protection Agency (EPA) screening model, and

2. The change in area-wide emissions including greenhouse gases (GHG) through a comparison of overall emission levels under baseline and proposed future conditions.

The study evaluated impacts and benefits from the proposed facility using several metrics including project-level carbon monoxide (CO) and particulate matter ($PM_{2.5}$ and PM_{10}); greenhouse gas (GHG) emissions; hazardous air pollutants (HAPs), including mobile source air toxics (MSAT) and ultra fine particulates (UFP); and regional emissions of ozone (O_3) by looking at the precursors including nitrogen oxides (NO_x) and volatile organic compounds (VOCs). Additionally, a general conformity determination was prepared to demonstrate that emissions fall below the federal *de minimis* threshold limits.



MPA GREEN BUS DEPOT
LOGAN INTERNATIONAL AIRPORT
EAST BOSTON, MASSACHUSETTS

NOISE MONITORING AND MODELING SITES AT THE PROPOSED GBD FACILITY

N

FIG. 11

The results of the prediction modeling indicate that there are no significant air quality impacts associated with the GBD development. In general, the same bus trips would occur along the airport roadway network independent of the project and bus trips between the airport and the existing off-airport maintenance facility would be eliminated. Therefore, the proposed action would result in a positive air quality impact with an overall reduction in emissions between the No Action and Build Conditions.

Furthermore, by implementing energy-saving LEED® Green Building design features, overall emissions from the GBD are expected to be below that of a conventional building. The design features selected to minimize the emissions from the maintenance facility include the following elements and activities:

- The entire facility (including the green building materials and the layout) is designed to minimize energy usage and thereby minimize pollutant emissions;
- Off-airport bus maintenance trips to the Chelsea repair and maintenance facility would be eliminated, thereby reducing emissions due to Massport bus vehicle miles traveled (VMT) to and from the storage and repair facility by 49 percent and reducing off-airport emissions by 100 percent;
- As a result of energy and operating efficiencies, the GBD will have a minimum of 20 percent lower GHG emissions than a traditional building;
- Compressed natural gas (CNG) and diesel-electric hybrid buses produce significantly lower emissions than comparable diesel buses;
- The diesel-electric hybrid buses would utilize ultra low sulfur diesel (ULSD) in combination with diesel particulate filers (DPF) to reduce particulate emissions, for example, by over 95 percent compared with traditional diesel engines; and,
- The diesel-electric hybrid buses retrofit with DPF emissions control technologies would also eliminate over 95 percent of all ultra fine particulate matter.

Localized concentrations of CO and PM were calculated for all on-airport activities, including idling and moving buses as well as boiler emissions. No exceedances of the National Ambient Air Quality Standards (NAAQS) or the Massachusetts Department of Environmental Protection (DEP) significant impact levels (SIL) are predicted from on-airport operations. Impacts at congested on-airport intersections are also expected to be well below the NAAQS since the worst-case or most congested intersections would operate at level of service (LOS) 'C' or better[5].

Since the airport is in an O_3 nonattainment area in the northeast ozone transport region (OTR) and a CO maintenance area, area-wide annual emissions of volatile organic compounds (VOC), oxides of nitrogen (NOx) and CO were compared with the federal *de minimis* limits of 100 tons per year (tpy) for NOx and CO and 50 tpy for VOC to demonstrate compliance with Section 176 of the General Conformity Rule (GCR). Future emissions for the nonattainment ozone precursors (VOC and NOx) and CO (the project is located in an EPA-designated CO maintenance area) are predicted to be well below the *de minimis* thresholds, even assuming all emissions resulting at the new facility would be new emissions. Therefore no formal conformity determination is required and potential air quality impacts would not be significant.

Greenhouse gas emissions for the facility, estimated at 669 total metric tons during construction and 540 annual metric tons during operations, are predicted to be well below the federal threshold of 25,000 metric tons recommended by the Council of Environmental Quality (CEQ) in February 2010 for disclosure purposes [CEQ, whitehouse.gov, 2/18/10]. Additionally, the GBD is also predicted to reduce GHG emissions approximately 30 percent by utilizing CNG and diesel-electric hybrid buses rather than traditional diesel buses. Finally, the GBD would also reduce vehicle miles traveled (VMT) to and from the maintenance facility by almost 50 percent between the No Build baseline and the Build Conditions. As a

[5] LOS 'C' or better indicates free flow traffic while LOS 'D, E or F' indicates congestion.

result, the GBD (while not required as part of and ENF) is expected to comply with the Massachusetts Environmental Policy Act's (MEPA) recently-revised *Greenhouse Gas Policy and Protocol* [May 5, 2010].

Since the GBD would include a fleet of CNG- and diesel-electric hybrid-powered buses rather than the traditional diesel buses, the proposed facility would not be a significant source of mobile source air toxics (MSAT).

There are no federal standards addressing emissions of ultra fine particulates (UFP). However, several studies indicate that UFP are virtually eliminated with diesel particulate filters (DPF) and diesel oxidation catalysts (DOC) that also utilize ULSD fuel. Additionally, since only 60 percent of the bus fleet includes diesel-electric hybrid buses that utilize smaller diesel engines, UFP emissions would be reduced even further. Particulate emissions (and UFP) from CNG bus engines with catalyst or other clean fleet technologies are reduced by over 90 percent compared to standard diesel engines [EPA].

6.8 Lighting

The exterior lighting will be designed to minimize light from the building and reduce sky-glow from the site. The use of low-height, low-cutoff light fixtures will limit light emittance from the building and site. Site and building mounted luminaries will produce a maximum initial luminance value of 0.1 foot-candle (FC) or less (horizontal and vertical) at the site boundary and no greater than 0.01 FC (horizontal) at 10 ft beyond the boundary. The vegetated edge along the northern boundary of the site will further screen light from the Swift Terrace and Neptune Circle neighborhoods.

6.9 Landscape

Massport will construct a landscape edge along the MBTA Blue Line tracks that will provide a natural and attractive separation between the Green Bus Depot and the adjacent neighbors along Swift Terrace and Neptune Circle. The landscape edge will feature elements that screen the maintenance facility from the neighborhoods both visually and with respect to sound. The landscape elements will improve and enhance the site area which is currently an unvegetated gravel area. The landscape elements will be complementary to the plantings proposed on the adjacent bus limo pool site.

Landscaping Features:

An earthen berm (approximately two-feet high) is proposed for the north edge of the project site, beginning north of the Flight Kitchen Support Area, and continuing east to the MWRA pump station. This berm will be centered within a 25 foot wide (minimum) landscape area between the MBTA Blue Line fence and the new fire lane immediately north of the Green Bus Depot.

The berm will be planted with a double row of evergreen trees (Austrian Pines) planted at 20 feet on center at approximately 6 feet high, with the two rows staggered to increase the visual barrier. The trees will complement the existing evergreen growth that already exists on the neighborhood side of the tracks immediately opposite the project site. Additional trees will be planted at the southeast corner of the site to help screen the project site from homes in that direction. The plantings will provide an attractive visual barrier as well as reduce intrusion from the limited light sources on sides of the buildings exposed to the neighborhoods as well as from headlights.

Lawn or plantings are intended for all ground surfaces not otherwise needed for parking, access, sidewalks, buildings, etc. Specific groundcover materials to the north of the project site will be coordinated with the MBTA's requirements. Plant materials within proposed detention basins and the bio-swale will be chosen for their tolerance to water and to the soils found on site. Plant materials used

elsewhere on the site will be chosen for their tolerance to site conditions. It is intended to use meadow grasses or other native groundcovers in order to minimize maintenance of these areas.

The south side of the site (adjacent to Wood Island Marsh) has an existing growth of trees and vegetation at the edge of the embankment. This area will incorporate the two detention basins and the bio-swale. This area will then be replanted.

The size and types of vegetation materials will be selected for their hardiness in this type of environment (near to marshland), their low maintenance aspects and their fast growing characteristics. Site irrigation needs will be minimized in keeping with a sustainable sites initiative of water efficiency.

Other landscape elements that will be included in the project area are sidewalks and fencing. Sidewalks will be provided to safely convey pedestrian employees coming from the MBTA station through the Bus/Limo Pool site to the Green Bus Depot to encourage use of public transportation. An 8 foot wide sidewalk will connect from the Bus/Limo Pool Site, and will continue west into the project site, running along the south boundary of the Flight Kitchen Support Area. Crosswalks will be provided where pedestrian traffic is required to cross vehicular traffic lanes and to direct pedestrians to the entrance.

The entire project site will be enclosed with an 8 foot high chain link fence as a security measure. The fence along the south (Wood Island Marsh) side of the project site will be located between the bioswale and the existing tree line. This fence will run along the east property boundary, adjacent to the pump station, and along the west boundary between the project site and the adjacent Bus/Limo Pool. The access driveway to the Green Bus Depot will be gated. The fence line will terminate on the west side at the Flight Kitchen Building, and on the east side at the MBTA Blue Line fencing, which will remain undisturbed.

6.10 Construction Impacts

Construction activities on the site will include activities such as foundation excavation, site grading, installation of utilities, building construction, paving and landscaping. Construction impacts will be temporary. Construction activities will occur during daylight hours when other community noise sources contribute to higher ambient noise levels. Appropriate noise control measures will be included to achieve compliance with the City of Boston Municipal Code including, for example, electric power rather than diesel generators, and well-maintained mufflers for construction equipment. Construction vehicles will be required to use designated routes to access the site.

Comprehensive soil erosion and sediment control plans will be implemented at the outset of construction and maintained throughout the construction phase in accordance with the NPDES construction general permit Stormwater Pollution Prevention Plan (SWPPP). Though Massport does not expect to encounter them, contaminated soils identified during construction will be handled in accordance with the Massachusetts Contingency Plan (MCP) and Massport Soil Handling and Disposal Guidelines.

7.0 Permitting

Redevelopment of the North Service Area for the Green Bus Depot will require the following environmental permits and/or approvals.

Local Permits

Boston Conservation Commission Order of Conditions: Since work is proposed within 100 feet of the coastal bank and potentially within the existing outfall, a Notice of Intent (NOI) will be submitted to the Boston Conservation Commission.

Boston Water and Sewer Commission Sewer Permit

State Permits

Massachusetts Environmental Policy Act (MEPA: An Environmental Notification Form (ENF) is required because the project will disturb more than 5 acres of land.

Chapter 91: Although the project site includes filled former tidelands, Massport's use of the filled former tidelands within the airport boundary is exempt from Chapter 91 licensing.

Coastal Zone Management Consistency Statement (CZM)**:** The CZM Consistency is addressed by the ENF.

401 Water Quality Certification (WQC): The project is not expected to generate more than 100 cubic yards of dredging; therefore, an individual WQC is not required and the surface water discharges are reviewed and approved through the Boston Conservation Commission Order of Conditions.

Emergency Generator Certification: Required under the Massachusetts Department of Environmental Protection Environmental Results Program (ERP).

Sewer Use Discharge Permit: Required from the Massachusetts Water Resources Authority for the discharge of industrial and sanitary wastewater to the sanitary sewer system.

Federal Permits

National Environmental Policy Act (NEPA): NEPA review is only required when a federal action is involved in the project. In this case, the federal action is a modification to the airport layout plan (ALP), or the use of federal funds. Categorical Exclusion (CE) documentation will be filed for consideration by the Federal Aviation Administration (FAA) after MEPA review is completed.

Federal Aviation Administration (FAA) Notice of Construction: Prior to construction, an FAA Notice of Construction Form 7460 will be submitted to the regional FAA Office. FAA will determine whether the project may cause temporary or permanent impacts to airspace, and will provide recommendations for any markings and beacons.

Section 404 Permit (Army Corps of Engineers): Because the project is likely to involve maintenance/repair to the existing stormwater outfall adjacent to the project site, a 404 Permit is required. Since the work has less than 5,000 square feet of impacts, a Category I General Permit is applicable. Category I permits only require notification to Army Corps of Engineers (ACOE).

USEPA National Pollutant Discharge Elimination System (NPDES) General Permit for Construction-Related Stormwater Discharge: Required for construction disturbing one or more acres of land.

8.0 Community Outreach

Massport's Office of Government and Community Affairs (OGCA) informs interested parties about projects being developed by the Authority. In addition, Massport personnel provide frequent project updates to elected representatives from East Boston (City Councilor, State Representative, and State Senator).

OGCA sponsored an abutters meeting on April 27, 2010, to discuss the proposed North Service Area Development plan including the Green Bus Depot. This meeting, held in East Boston, highlighted to the direct abutters the phasing of the Green Bus Depot and other Massport activities in the North Service Area. The consultant hired by AIR Inc. was provided with slides from the overview meeting, depicting the North Service Area plans.

9.0 ENF Distribution

This Environmental Notification Form has been distributed to Federal, state, and city agencies and to parties listed in this Chapter (see Table 5). The list includes those entities that the *Massachusetts Environmental Policy Act (MEPA)* requires as part of the review of the document; representatives of governmental agencies; and interested individuals and community groups.

Printed copies of the ENF may be requested from Tom Ennis, Senior Project Manager, Massport, Suite 200 South, Second Floor, Logan Office Center, One Harborside Drive, East Boston, MA 02128, telephone (617) 568-3507, e-mail: tennis@massport.com Printed copies and CD's of this ENF are available for review at the public libraries listed in Table 5, below:

Table 5: ENF Distribution

P = Print copy of the ENF provided
C = CD copy of the ENF provided

Federal Government

U.S. Senators and Representatives

U.S. Representative Ed Markey Attn: Patrick Lally 188 Concord Street, Suite 102 Framingham, MA 01702	C	U.S. Representative Michael E. Capuano Attn: Danny Ryan 110 First Street Cambridge, MA 02141	C
U.S. Senator John Kerry 218 Russell Senate Office Building Second Floor Washington, DC 20510 Attn: Cheri M. Rolfes	C	U. S. Senator Scott Brown JFK Federal Building 55 New Sudbury Street Boston, MA 02203 Attn: Lydia Goldblatt	C

U.S. Environmental Protection Agency

EPA New England (Region 1) Attention: NPDES Permit Division 1 Congress Street, Suite 1100 Boston, MA 02114	P	Elizabeth Higgins Congram, Regional Administration U.S. Environmental Protection Agency New England Region (Region 1) 1 Congress Street, Suite 1100 Boston, MA 02114	P

Federal Aviation Administration

Richard Doucette, Manager Environmental Programs Department of Transportation Federal Aviation Administration New England Region 12 New England Executive Park, Box 510 Burlington, MA 01803	P	Ralph Nicosia-Rusin Manager Environmental Programs Department of Transportation Federal Aviation Administration New England Region 12 New England Executive Park, Box 510 Burlington, MA 01803	P

Federal Highway Administration

Damaris Santiago, Environmental Engineer FHWA Massachusetts Division 55 Broadway, 10th Floor Cambridge, MA 02142	P

State Government

Massachusetts Senate/House of Representatives

Senate President Therese Murray Massachusetts State House, Room 330 Boston, MA 02133	C	Speaker Robert A. DeLeo Massachusetts State House, Room 356 Boston, MA 02133	C
Senator Steven Baddour Massachusetts State House, Room 513 Boston, MA 02133	C	Representative Joseph C. Wagner Massachusetts State House, Room 134 Boston, MA 02133	C
Senator John A. Hart Massachusetts State House, Room 109C Boston, MA 02133	C	Representative Kathi-Anne Reinstein Massachusetts State House, Room 167 Boston, MA 02133	C
Senator Anthony Petruccelli Massachusetts State House, Room 413B Boston, MA 02133	C	Representative Eugene L. O'Flaherty Massachusetts State House, Room 136 Boston, MA 02133	C
Representative Brian Wallace Massachusetts State House, Room 472 Boston, MA 02133	C	Representative Carlo Basile Massachusetts State House, Room 39 Boston, MA 02133	C

Executive Office of Energy and Environmental Affairs			
Secretary Ian A. Bowles (submitted herein) Executive Office of Energy and Environmental Affairs Attn: Alicia McDevitt, Director MEPA Office 100 Cambridge Street, Suite 900 Boston, MA 02114	P	Alicia McDevitt MEPA Director Executive Office of Energy and Environmental Affairs, MEPA Office 100 Cambridge Street, Suite 900 Boston, MA 02114	P
Executive Office of Energy and Environmental Affairs – Policy Director Undersecretary for Policy 100 Cambridge Street, Suite 900 Boston, MA 02114	P	Executive Office of Energy and Environmental Affairs Department of Energy Resources Attn: John Ballam 100 Cambridge Street, Suite 900 Boston, MA 02114	P
Massachusetts Department of Environmental Protection			
Laurie Burt, Commissioner Department of Environmental Protection One Winter Street Boston, MA 02108	C	John D. Viola, Deputy Regional Director Northeast Regional Office Department of Environmental Protection 205B Lowell Street Wilmington, MA 01887	C
Nancy Baker, MEPA Coordinator Northeast Regional Office Department of Environmental Protection 205B Lowell Street Wilmington, MA 01887	C	Rachel Freed, Section Chief Wetlands and Waterways – NERO Department of Environmental Protection 205B Lowell Street Wilmington, MA 01887	C
Jerome Grafe Department of Environmental Protection – BWP One Winter Street, 10th Floor Boston, MA 02108	C	Department of Environmental Protection Attention: Nancy Seidman One Winter Street Boston, MA 02114	C
Iris Davis, Bureau of Waste Site Cleanup Section Chief Permits/Risk Reduction – NERO - DEP 205B Lowell Street Wilmington, MA 01887	C	Christine Kirby, Transportation Programs Department of Environmental Protection One Winter Street, 9th Floor Boston, MA 02108	C
Massachusetts Executive Office of Health and Human Services			
Suzanne K. Condon Associate Commissioner Executive of Public Health 250 Washington Street Boston, MA 02108	C		
Massachusetts Department of Conservation and Recreation			
Rick Sullivan Commissioner Department of Conservation and Recreation 251 Causeway Street, Suite 600 Boston, MA 02114-2104	C	Priscilla E. Geiges, Director Division of State Parks Department of Conservation and Recreation 251 Causeway Street, Suite 600 Boston, MA 02114	C
Massachusetts Department of Fisheries, Wildlife, and Environmental Law Enforcement			
Environmental Reviewer Massachusetts Wildlife & Environmental Law Enforcement Field Headquarters – Route 135 Westborough, MA 01581	C		
Massachusetts Department of Housing and Community Development			
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Boston Public Library East Boston Branch 276 Meridian Street East Boston, MA 02128	P	Boston Public Library Orient Heights Branch 18 Barnes Avenue East Boston, MA 02128	P
Winthrop Public Library One Metcalf Square Winthrop, MA 02151	P	Chelsea Public Library 569 Broadway Chelsea, MA 02150	P
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Appendix A Agency Consultation Letters

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Commonwealth of Massachusetts

Division of Fisheries & Wildlife

MassWildlife

Wayne F. MacCallum, *Director*

March 29, 2010

Joanne Haracz
AECOM
66 Long Wharf
Boston MA 02110

RE: Project Location: North Service Area, Boston Logan International Airport
Project Description: Proposed Bus Maintenance Facility
NHESP Tracking No.: 10-27913

Dear Applicant:

Thank you for submitting information regarding the project, outlined above, to the Natural Heritage & Endangered Species Program (NHESP) of the Massachusetts Division of Fisheries & Wildlife.

Based on a review of the information that was provided and the information that is currently contained in our database, the NHESP has determined that this project, as currently proposed, **does not occur within Estimated Habitat of Rare Wildlife or Priority Habitat** as indicated in the *Massachusetts Natural Heritage Atlas* (13th Edition). Therefore, the project is not required to be reviewed for compliance with the rare wildlife species section of the Massachusetts Wetlands Protection Act Regulations (310 CMR 10.37, 10.59 & 10.58(4)(b)) or the MA Endangered Species Act Regulations (321 CMR 10.18). Any additional work beyond that shown on the site plans may require a filing with the NHESP.

Please note that this determination addresses only the matter of **rare** wildlife habitat and does not pertain to other wildlife habitat issues that may be pertinent to the proposed project. If you have any questions regarding this letter please contact Amy Coman, Endangered Species Review Assistant, at (508) 389-6364.

Sincerely,

Thomas W. French

Thomas W. French, Ph.D.
Assistant Director

United States Department of the Interior

FISH AND WILDLIFE SERVICE

New England Field Office
70 Commercial Street, Suite 300
Concord, NH 03301-5087
http://www.fws.gov/newengland

January 4, 2010

To Whom It May Concern:

This project was reviewed for the presence of federally-listed or proposed, threatened or endangered species or critical habitat per instructions provided on the U.S. Fish and Wildlife Service's New England Field Office website:

(http://www.fws.gov/newengland/EndangeredSpec-Consultation.htm)

Based on the information currently available, no federally-listed or proposed, threatened or endangered species or critical habitat under the jurisdiction of the U.S. Fish and Wildlife Service (Service) are known to occur in the project area(s). Preparation of a Biological Assessment or further consultation with us under Section 7 of the Endangered Species Act is not required.

This concludes the review of listed species and critical habitat in the project location(s) and environs referenced above. No further Endangered Species Act coordination of this type is necessary for a period of one year from the date of this letter, unless additional information on listed or proposed species becomes available.

Thank you for your cooperation. Please contact Mr. Anthony Tur at 603-223-2541 if we can be of further assistance.

Sincerely yours,

Thomas R. Chapman
Supervisor
New England Field Office

FEDERALLY LISTED ENDANGERED AND THREATENED SPECIES IN MASSACHUSETTS

COUNTY	SPECIES	FEDERAL STATUS	GENERAL LOCATION/HABITAT	TOWNS
Barnstable	Piping Plover	Threatened	Coastal Beaches	All Towns
	Roseate Tern	Endangered	Coastal beaches and the Atlantic Ocean	All Towns
	Northeastern beach tiger beetle	Threatened	Coastal Beaches	Chatham
	Sandplain gerardia	Endangered	Open areas with sandy soils.	Sandwich and Falmouth.
	Northern Red-bellied Cooter	Endangered	Inland Ponds and Rivers	Bourne (north of the Cape Cod Canal)
Berkshire	Bog Turtle	Threatened	Wetlands	Egremont and Sheffield
Bristol	Piping Plover	Threatened	Coastal Beaches	Fairhaven, Dartmouth, Westport
	Roseate Tern	Endangered	Coastal beaches and the Atlantic Ocean	Fairhaven, New Bedford, Dartmouth, Westport
	Northern Red-bellied Cooter	Endangered	Inland Ponds and Rivers	Taunton
Dukes	Roseate Tern	Endangered	Coastal beaches and the Atlantic Ocean	All Towns
	Piping Plover	Threatened	Coastal Beaches	All Towns
	Northeastern beach tiger beetle	Threatened	Coastal Beaches	Aquinnah and Chilmark
	Sandplain gerardia	Endangered	Open areas with sandy soils.	West Tisbury
Essex	Small whorled Pogonia	Threatened	Forests with somewhat poorly drained soils and/or a seasonally high water table	Gloucester, Essex and Manchester
	Piping Plover	Threatened	Coastal Beaches	Gloucester, Essex, Ipswich, Rowley, Revere, Newbury, Newburyport and Salisbury
Franklin	Northeastern bulrush	Endangered	Wetlands	Montague
	Dwarf wedgemussel	Endangered	Mill River	Whately
Hampshire	Small whorled Pogonia	Threatened	Forests with somewhat poorly drained soils and/or a seasonally high water table	Hadley
	Puritan tiger beetle	Threatened	Sandy beaches along the Connecticut River	Northampton and Hadley
	Dwarf wedgemussel	Endangered	Rivers and Streams.	Hadley, Hatfield, Amherst and Northampton
Hampden	Small whorled Pogonia	Threatened	Forests with somewhat poorly drained soils and/or a seasonally high water table	Southwick
Middlesex	Small whorled Pogonia	Threatened	Forests with somewhat poorly drained soils and/or a seasonally high water table	Groton
Nantucket	Piping Plover	Threatened	Coastal Beaches	Nantucket
	Roseate Tern	Endangered	Coastal beaches and the Atlantic Ocean	Nantucket
	American burying beetle	Endangered	Upland grassy meadows	Nantucket
Plymouth	Piping Plover	Threatened	Coastal Beaches	Scituate, Marshfield, Duxbury, Plymouth, Wareham and Mattapoisett
	Northern Red-bellied Cooter	Endangered	Inland Ponds and Rivers	Kingston, Middleborough, Carver, Plymouth, Bourne, Wareham, Halifax, and Pembroke
	Roseate Tern	Endangered	Coastal beaches and the Atlantic Ocean	Plymouth, Marion, Wareham, and Mattapoisett.
Suffolk	Piping Plover	Threatened	Coastal Beaches	Winthrop
Worcester	Small whorled Pogonia	Threatened	Forests with somewhat poorly drained soils and/or a seasonally high water table	Leominster

-Eastern cougar and gray wolf are considered extirpated in Massachusetts.
-Endangered gray wolves are not known to be present in Massachusetts, but dispersing individuals from source populations in Canada may occur statewide.
-Critical habitat for the Northern Red-bellied Cooter is present in Plymouth County.

Revised 06/22/2009

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Appendix B Noise Technical Report

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Noise Technical Report

Green Bus Depot (GBD)

Prepared for:

Massachusetts Port Authority
The Logan Office Center
One Harborside Drive, Suite 200S
East Boston, MA 02128-2909

Prepared by:

AECOM

38 Chauncy Street, Suite 1200
Boston, MA 02111

July 2010

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Executive Summary

A noise assessment was conducted to document the potential impacts associated with the operation and construction of Massport's proposed Green Bus Depot (GBD) at Logan International Airport's North Service Area in East Boston. The noise assessment was prepared in accordance with the National Environmental Policy Act (NEPA) to disclose the potential for impacts from the future maintenance facility.

For purposes of this study it was assumed that no noise impacts are caused by the existing on-going use of the project site. Additionally, no "noise credit" was taken for the elimination of the existing off-airport bus maintenance activities in Chelsea, or the elimination of the vehicle miles traveled (VMT) through East Boston and Chelsea by buses being stored and maintained at the existing Chelsea bus maintenance facility. Instead a detailed prediction model was developed to simulate the future noise sources at the proposed GBD in the North Service Area, the existing terrain effects and any building reflections. Project noise sources specified in the prediction model include stationary or idling buses, on-site bus movements, bus refueling and washing, maintenance activities and rooftop ventilation fans. Bus operations data for various periods of the day are consistent with the bus trips utilized in the Consolidated Rental Car (CONRAC) Facility Study [EOEA #14137). Field measurements were also conducted at the closest residences to document the baseline noise conditions in the vicinity of the proposed GBD.

The results of the prediction modeling indicate that there are no significant noise impacts associated with the GBD development. By implementing several LEED® Green Building design features, future noise levels from the maintenance facility are predicted to be at or below the existing baseline levels. The design features selected to minimize the noise profile of the maintenance facility include the following elements and activities:

- The proposed site is laid out and arranged to locate the quieter elements (bus parking) closest to the neighborhood and the louder activities (such as bus maintenance and washing) farthest from the community;
- The proposed buildings would also be strategically arranged whereby the largest bus storage building (or Shed) would act as noise barrier to shield the neighborhood from the other facility activities;
- The entire facility is intended to minimize or eliminate the use of back-up alarms by operating in a one-way counter-clockwise direction so that buses flow through the refueling, washing, maintenance and storage areas without the need to back-up;
- Compressed natural gas (CNG) and diesel-electric hybrid buses are significantly quieter than comparable diesel buses while stationary and while accelerating;
- Buses would idle on-site less than five minutes in accordance with State law (M.G.L., Chapter 90, Section 16A);
- Except for emergency repairs, all scheduled maintenance activities are intended to occur during the daytime from 7:00 AM to 5:00 PM;
- In addition to locating all maintenance activities indoors, the Maintenance Bays building would include overhead doors to further contain maintenance noise;
- The bus wash building, which would be located furthest from the neighborhood, would contain overhead doors to contain jet washing noise indoors;

- Rooftop ventilation fans would be provided with sound attenuators and would be located on the lower roof of the Administration Building so that the mechanical equipment if further shielded by the higher Bus Barn roofline;
- All employee parking would be located east of the Administration Building so that it would be shielded by the bus storage Bus Barn building;
- Sustainable landscaping (such as berms and trees) would be provided around the perimeter of the facility to further reduce noise impacts; and,
- The late night/early morning bus access route would be relocated away from Wood Island Station and the Swift Terrace neighborhood to minimize nighttime noise impacts.

As shown in **Table ES-1**, the future 24-hour day-night cumulative noise levels (L_{dn}) are the same as the Existing Conditions and are, therefore, not predicted to exceed the allowable increase criteria from the Federal Aviation Administration (FAA). Similarly, as shown in **Table ES-2**, late night peak hour noise levels at 1:00 AM (during maximum facility bus activity) are also not predicted to exceed the Massachusetts Department of Environmental Protection (DEP) criteria of 10 decibels above the measured background. The peak hour project noise levels during the 1:00-2:00 AM period are also not predicted to exceed the City of Boston Air Pollution Control Committee's (APCC) nighttime threshold of 50 decibels, which is primarily intended for stationary sources such as rooftop ventilation fans.

Table ES-1: Cumulative Noise Effects-FAA 24-hour Regulatory Criteria

ID	Name	Existing Conditions[1]	Future Project	Cumulative Noise Levels	Increase Over Existing	Evaluation Criteria
R1	Swift Terrace	72	45	72	0.0	1.5
R2	Neptune[1]	68	49	68	0.0	1.5
R3	Cowper St.	68	46	68	0.0	1.5

1 Existing noise levels were measured in March and May 2010 in the community.

Table ES-2: Cumulative Noise Effects - DEP Peak-Hour (1:00 AM) Regulatory Criteria

ID	Name	Existing Conditions[1]	Future Project	Evaluation Criteria
R1	Swift Terrace	46	43	56
R2	Neptune[1]	46	45	56
R3	Cowper St.	46	45	56

1 Existing noise levels were measured in March and May 2010 in the community.

To assess the potential for speech interference, particularly indoors, maximum instantaneous noise levels (or L_{max}) were evaluated. As shown in **Table ES-3**, L_{max} noise levels are predicted to range from 35 dBA indoors to 60 dBA outdoors at the closest residences along Neptune Circle. These levels are not predicted to exceed the Federal Interagency Committee on Aircraft Noise (FICAN) limits of 70-75 dBA outdoors or the NC30 design curve used to evaluate the potential for noise to interfere with speech.

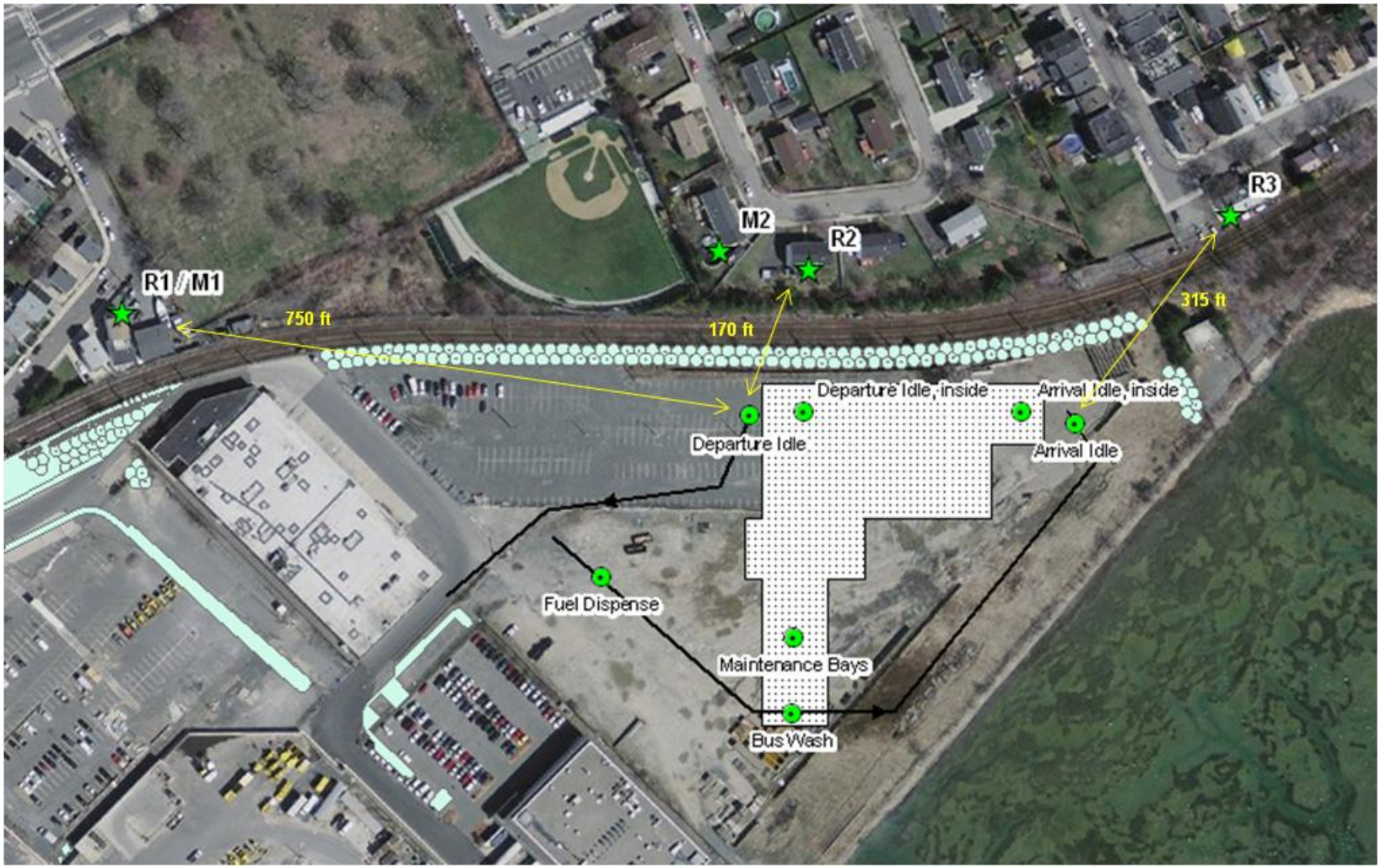
Table ES-3: Single Event Noise Exposure (Speech Interference)

Receptor		Exterior (façade)[1]		Interior (bedroom)		Exterior Criteria[2]	Interior Criterion[3]
ID	Name	CNG	HYB	CNG	HYB		
R1	Swift Terrace	42	44	17	19	70-75	40
R2	Neptune Circle	58	60	33	35	70-75	40
R3	Cowper Street	52	54	27	29	70-75	40

1 The maximum reference noise levels for accelerating buses (provided by the manufacturers) ranges from 73 dBA for CNG buses to 75 dBA for diesel-electric hybrid buses at 50 feet.
2 The range of noise levels associated with speech interference as reported by the Federal Interagency Committee on Aircraft Noise (FICAN) are reproduced from the CONRAC Study. These levels are assessed outdoors with an implied impact indoors assuming open windows.
3 Interior noise thresholds to assess speech interference are based on the NC30 curve for bedrooms and other quiet rooms.

The location of the proposed bus maintenance facility, the various bus noise sources (including the bus arrival and departure routes, and idling locations), and the closest residences are shown graphically in **Figure ES-1**. The modeled source shown in **Figure ES-1** include the following:

- Idle upon arrival, outside Shed (Arrival Idle)
- Idle upon arrival, inside Shed (Arrival Idle, Inside)
- Idle before departure, outside Shed (Departure Idle)
- Idle before departure, inside Shed (Departure Idle, Inside)
- Idling inside the maintenance bays (Maintenance Bays)
- Idling inside the bus wash (Bus Wash)
- Idling at the refueling station (Fuel Dispense)
- Moving buses (solid lines with directional arrow)



NB: Noise and receptor sources include: arrival and departure routes (Moving Buses) shown with “solid lines with directional arrow”; bus idling sites shown with “black dot on a green circle”; representative receptors shown with “green stars”.

Figure ES-1 - Noise Monitoring and Modeling Sites at the Proposed GBD Facility

1. Introduction

A new Green Bus Depot (GBD) is proposed in the North Service Area (NSA) of Boston's Logan International Airport. The proposed GBD would provide the Massachusetts Port Authority's (Massport) with the necessary on-airport facilities to maintain a new fleet of clean-fuel shuttle buses (including diesel-electric hybrid and compressed natural gas) and to accommodate existing shuttle bus routes and the new Unified Bus System that will serve Logan's new consolidated Rental Car Facility (EEA# 14137). As described in this report, a noise assessment was conducted to determine the potential impacts to nearby sensitive receptors as a result of Massport's proposed construction and operation of a new GBD.

The noise assessment includes 1) a monitoring program to define the existing ambient conditions and project impact criteria, 2) a detailed impact modeling analysis to predict future levels from the on-site bus movements and idling within the facility including parking lot, refueling station, bus washing station, and bus storage and maintenance building, and 3) a comparison with appropriate noise guidelines to determine whether abatement measures would be warranted.

2. Noise Fundamentals and Metric

While most people conduct their daily lives in an environment full of sounds, some or all of these sounds can be undesirable and may detract from the quality of the human environment. A number of factors affect sound as it is perceived by the human ear. These factors include the actual level of the sound, the frequencies involved, the period of exposure, and changes or fluctuations in sound levels during exposure. Noise levels are measured in units called decibels (dB). Because the human ear cannot perceive all pitches or frequencies equally well, noise measures are adjusted to compensate for the human lack of sensitivity to low-pitched and high-pitched sounds. This adjusted unit is known as the A-weighted decibel (dBA). The A-weighted metric de-emphasizes both very low- and very high-pitched sounds, so measured levels better correlate with human perception.

Human response to changes in noise levels depends on a number of factors, including the quality of the sound, the magnitude of the changes, the time of day at which the changes take place, whether the noise is continuous or intermittent, and the individual's ability to perceive the changes. Human ability to perceive changes in noise levels varies widely with the individual, as does response to the changes. A change in noise level of less than three (3) dBA is barely perceptible to most listeners while a ten (10) dBA change normally is perceived as a doubling (or halving) of noise. These thresholds allow for estimation of an average individual's probable perception of, and reaction to, changes in noise levels.

However, the dBA noise metric describes noise levels in a static way whereas noise levels are rarely steady and unchanging. Therefore, methods to describe and evaluate changing noise levels over time have been developed. One way of describing fluctuating sound is to describe the fluctuating noise heard over a specific period as if it were a steady, unchanging sound. To this effect, a descriptor called the equivalent sound level (L_{eq}) can be computed. The L_{eq} descriptor is the constant sound level that, in a given situation and time period (e.g., one-hour L_{eq}, or 24-hour L_{eq}), conveys the same sound energy as the actual time-varying sound. Statistical

sound level descriptors such as L_{90} are also used to indicate the background level or the noise level exceeded 90 percent of the time.

Alternatively, it is often useful when measuring noise levels to take into account the difference in perception and response between daylight, waking hours and nighttime, sleeping hours. To this end, a descriptor called the day-night noise level (DNL) has been developed. DNL is defined as the A-weighted average sound level during a 24-hour period, with a ten-dBA penalty weighting applied to noise occurring during nighttime (10 pm to 7 am). The ten-dBA weighting accounts for the fact that noises at night are more perceptible because of lesser background noise levels.

The DNL descriptor has been recognized by various federal agencies including the Department of Housing and Urban Development (HUD), the USEPA, the Federal Aviation Administration (FAA), Federal Transit Administration (FTA) as one of the most appropriate metrics for estimating the degree of nuisance or annoyance that increased noise levels would cause in residential neighborhoods. Therefore, DNL has been selected as the appropriate noise descriptor for this analysis.

3. Noise Evaluation Criteria

Federal and state agencies have adopted various standards and guidelines for assessing noise impacts. These regulations and standards are useful to review because they provide both a characterization of the quality of the existing noise environment and a measure of project-induced impacts when applicable. These guidelines were considered in the analysis.

Federal Aviation Administration

In June 1980, the Federal Interagency Committee (FIC) on Urban Noise published guidelines relating DNL to compatible land uses. Since the issuance of these guidelines, federal agencies have generally adopted them for their noise analyses. Following the lead of the committee, the FAA has adopted the concept of land use compatibility as the accepted measure of aircraft noise effect. The FAA incorporated the committee's guidelines in the Federal Aviation Regulations. Although these guidelines are not mandatory, they provide the best method to assess noise impacts in airport communities. In general, residential land uses are not compatible with an outdoor DNL above 65 dBA. The extent to which land areas and populations are exposed to a DNL of 65 dBA or higher, provides one of the criteria with which to assess and compare the noise impacts of alternative aircraft actions. The FAA impact guidelines are shown in **Table 1**.

Federal Transit Administration

The FTA has defined several noise metrics that are applicable to specific land use categories (**Table 2**), and has developed a series of noise assessment procedures that are applicable to transit projects such as a bus rapid transit project.

Table 1: FAA Impact Guideline

DNL Exposure Interval of Alternative or Project	Change in DNL	Characterization of Change	Reference
40 dB to less than 60 dB	5.0 dB or more	Slight to Moderate Change	FICON, 1992; Federal Register Notice, Vol. 65 Page 76339; FAA Order 1050.1E, Change 1, 2006
60 dB to less than 65 dB	3.0 dB or more	Slight to Moderate Change; potential for mitigation should be considered	FAA Order 1050.1E, Change 1, 2006
Greater than or equal to 65 dB	1.5 dB or more	Significant impact; eligible for mitigation	FAA Order 1050.1E, Change 1, 2006; FAA Order 5050.4b, 2006; 14 CFR Part 150, FICON, 1992.

Table 2: FTA Land Use Category

Land-Use Category	Noise Metric	Description
1	$L_{eq}(h)$	Tracts of land set aside for serenity and quiet, such as outdoor amphitheaters, concert pavilions, and historic landmarks.
2	DNL or L_{dn}	Buildings used for sleeping such as residences, hospitals, hotels, and other areas where nighttime sensitivity to noise is of utmost importance.
3	$L_{eq}(h)$	Institutional land uses with primarily daytime and evening uses including schools, libraries, churches, museums, cemeteries, historic sites, and parks, and certain recreational facilities used for study or meditation.

The FTA noise impact criteria are defined by two curves (**Figure 1**). The curves allow project noise levels to increase as existing noise increases, beyond which impact is determined based on project noise alone.

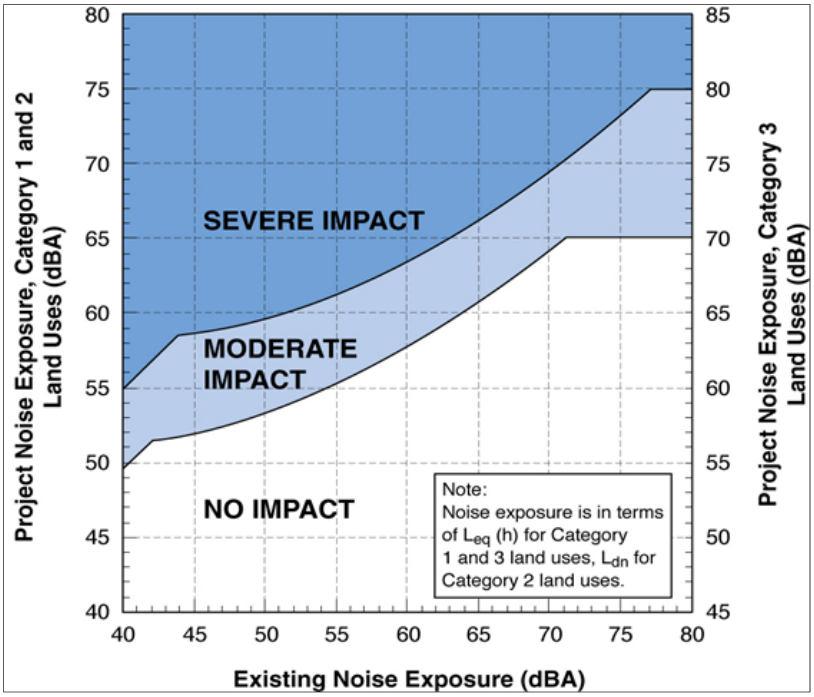


Figure 1 - FTA Noise Impact Criteria

The FTA noise criteria are delineated into two categories: *moderate impact* and *severe impact*. The *moderate impact* threshold defines areas where the change in noise is noticeable but may not be sufficient to cause a strong, adverse community reaction. The *severe impact* threshold defines noise limits above which a significant percentage of the population would be highly annoyed by new noise. The level of impact at any specific site can be established by comparing the predicted project noise level at the site to the existing noise level at the site.

Department of Housing and Urban Development

HUD has adopted environmental guidelines for determining the acceptability of federally-assisted projects and proposed mitigation measures to ensure that activities assisted by HUD will achieve the goal of a suitable living environment. These guidelines are strictly advisory.

HUD assistance for the construction of new noise-sensitive land uses is generally prohibited for projects with "unacceptable" noise exposure and is discouraged for projects with "normally unacceptable" (as defined in **Table 3**) noise exposure. This policy applies to all HUD programs for residential housing, college housing, mobile home parks, nursing homes, and hospitals. It also applies to HUD projects for land development, new communities, redevelopment, or any other provision of facilities and services that is directed toward making land available for housing or noise-sensitive development.

Sites falling within the "normally unacceptable" zone require mitigation, such as implementation of sound attenuation or reduction measures: a five-dB reduction if the DNL is greater than 65 dB, but does not exceed 70 dB; and a ten-dB reduction if the DNL is greater than 70 dB, but does

not exceed 75 dB. If the DNL exceeds 75 dB, the site is considered unacceptable for residential use.

Table 3: HUD Site Acceptability Standards

Noise	Day/Night Sound Level (DNL)
Acceptable	Not exceeding 65 dB
Normally Unacceptable	Above 65 dB but not exceeding 75 dB
Unacceptable	Above 75 dB

Source: 24 CFR Part 51.

Massachusetts Department of Environmental Protection

The Massachusetts Department of Environmental Protection (DEP) Division of Air Quality Control defines its own regulation (310 CMR 7.10) for noise control as follows.

A source of sound will be considered to be violating the Department's noise regulation if, measured at the property line and at the nearest inhabited residence, the source:

- Increases the broadband sound level by more than 10 dB(A) above ambient, or
- Produces a "pure tone" condition - when any octave band center frequency sound pressure level exceeds the two adjacent center frequency sound pressure levels by 3 decibels or more.

The DEP noise guidelines, which are better suited for evaluation of stationary, relatively constant noise sources, do not correlate well with airport environments, which have high variability in existing background noise levels from hour to hour and day to day. For such variable sources and background environments, the DEP noise guidelines do not represent definitive criteria, because there is wide latitude for interpretation of how noise levels would be measured, averaged, and compared and what metrics would be appropriate. However, as requested by Massport, all applicable noise criteria were evaluated to determine the potential for impacts from the GBD.

City of Boston

Local noise ordinances for stationary sources may also be evaluated using the Air Pollution Control Commission (APCC) "Regulations for the Control of Noise in the City of Boston". The City of Boston noise limits apply to residential land-uses and include both broadband and octave-band threshold limits. These are summarized in **Table 4**.

Table 4: City of Boston Noise Standards by Zoning District

Octave Band Center Frequency of Measurement (Hz)	Residential		Residential/Industrial		Business	Industrial
	Daytime	All Other Times	Daytime	All Other Times	Anytime	Anytime
31.5	76	68	79	72	79	83
63	75	67	78	71	78	82
125	69	61	73	65	73	77
250	62	52	68	57	68	73
500	56	46	62	51	62	67
1000	50	40	56	45	56	61
2000	45	33	51	39	51	57
4000	40	28	47	34	47	53
8000	38	26	44	32	44	50
Single Number Equivalent	60 dBA	50 dBA	65 dBA	55 dBA	65 dBA	70 dBA

Similar to the DEP criteria, the City of Boston noise standards are also more applicable to stationary sources with constant or recurring equipment such as fans, blowers or pumps. Although the GBD will include roof-top ventilation fans, these fans will be shielded by the roof parapets and are not expected to be a dominant noise source. However, as requested by Massport, the APCC noise standards were applied to the future bus operations to determine the potential for impact particularly during the late night hours between 1:00 and 2:00 AM.

Speech Interference

To assess the potential for speech interference, maximum audible noise levels were used. The Federal Interagency Committee on Aircraft Noise (FICAN) has developed conservative guidelines for assessing interference with speech.[1] The FICAN guidelines are intended to assess the potential for speech interference. The guidelines provided here for speech interference and sleep disturbance are intended only to serve as benchmarks to provide context for the sound levels discussed for the purposes of this analysis only, and should not be interpreted as impact criteria. Therefore, the following evaluation limits were used to assess the potential for speech interference from single noise events:

- Speech interference may occur outdoors at 60 to 65 dBA or higher;
- Speech interference may occur indoors when the outdoor level is 70 to 75 dBA or higher (windows open);
- Speech interference may occur indoors when the outdoor sound level is 75 to 80 dBA or higher (windows closed).

[1] "Effects of Aviation Noise on Awakenings from Sleep," FICAN, 1997.

Other guidelines used to evaluate the quality of speech intelligibility indoors are the noise criterion (NC) curves. Specifically, NC30 is used to evaluate quiet interior spaces such as bedrooms and hospitals. As shown in **Figure 2**, the NC30 curves are applied by octave bands whereby poor speech intelligibility could occur if any of the project noise levels exceeds at any frequency.

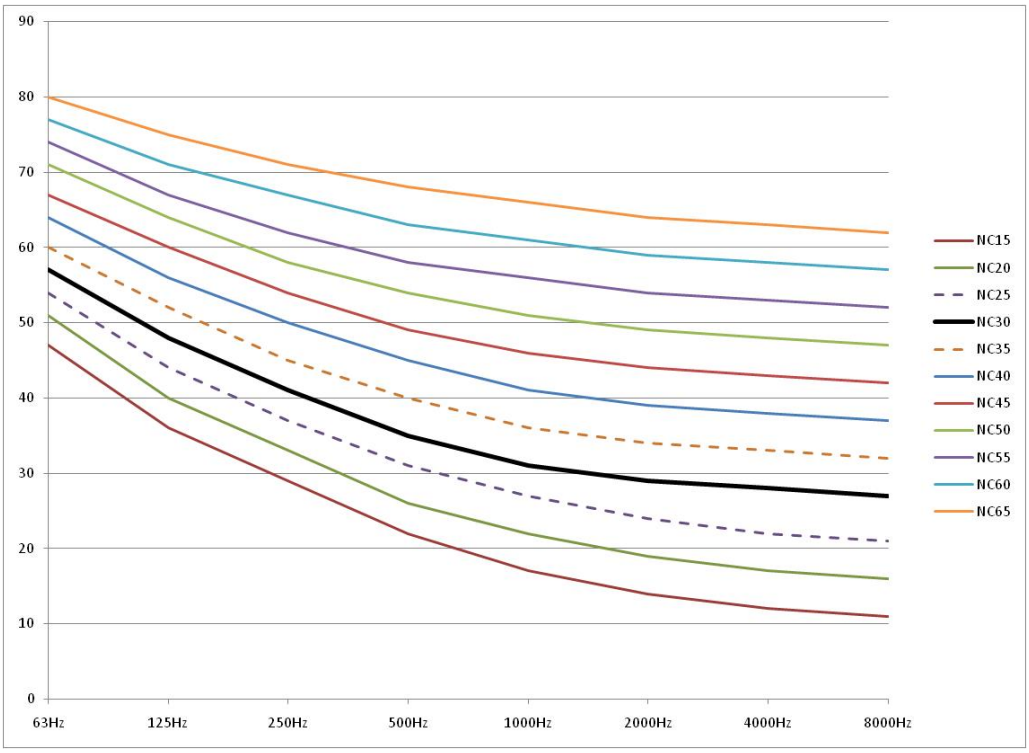


Figure 2 - NC Curves to Assess Speech Intelligibility

4. Existing Conditions

Ambient Noise Measurements

An ambient noise monitoring program was conducted on March 1-4 and May 13-15, 2010 to measure existing levels at the closest residences to the proposed GBD facility. At the time of the study, no activities were taking place on the project site, so the existing baseline for the project site was the absence of any noise sources. The measurements were made continuously on an hourly basis for the duration of the monitoring period at two residences closest to the proposed GBD site: Site M1 (see Figure 3) along Swift Terrace and Site M2 along Neptune Circle. Site M3 was measured opposite residences along Cowper Street. The multi-day, continuous noise survey serves the purposes of 1) evaluating the likely ambient levels when other background sources such as an airplane, train and parking lot activities are at a minimum, 2) providing a comparison with applicable 24-hour threshold (such as DNL) and other noise-sensitive periods such as 1:00-2:00 AM; and 3) to determine the threshold of impact for the FTA and DEP criteria. The weather conditions during the survey duration were considered suitable for collecting ambient noise levels for the duration of the monitoring program.

The sound level meters that were used for this project meet or exceed the ANSI Standards for Type I accuracy and quality and are listed below:

- Brüel & Kjaer Type 2250 Precision Sound Level Meter.
- Brüel & Kjaer Type 2236 Precision Sound Level Meter.

The sound level meters were calibrated before and after each measurement. Microphone height was set approximately 5 feet above ground level. A wind screen was used to minimize wind noise across the face of the microphone. As shown in **Figure 3**, three monitoring sites were selected for the survey representing the closest residential clusters to the project site. Specifically, Site M1 was selected to represent the Swift Terrace residences, Site M2 was chosen to represent the cluster of homes along Neptune Circle, and Site M3 was selected to represent the Cowper Street residences. All ambient noise levels were measured in A-weighted levels for comparison with the applicable criteria.

The measurements are summarized in **Table 5**. The lowest DNL levels recorded on those days range from 68 dBA at site M2 (Neptune Circle) to 70 dBA at Site M3 (Cowper Street) to 73 dBA at Site M1 (Swift Terrace). The DNL levels were relatively high primarily due to the contributions from trains passing by from the MBTA Blue Line.

Figure 3 - Noise Monitoring Sites in the Vicinity of the Proposed Massport GBD Facility

Table 5 also provides a summary of L_{eq} hourly levels measured at each site during the relatively quiet nighttime hour between 1:00 to 2:00 AM (to coincide with the future peak bus operations) and 3:00 to 4:00 AM (to coincide with the future GBD start-up period). Average background noise levels measured during these periods range from 43 dBA at Site M1 (Neptune Circle) to 49 dBA at Site M2 (Swift Terrace near the MBTA Wood Island Station). However, due to the closeness of the sites to one another and their relative similar exposure to ambient noise (such as the MBTA Blue Line), an acoustical average background noise level of 46 dBA was used to describe the ambient noise level during these two periods.

Table 5: Measured Ambient Noise Levels (dBA)

Site	Representative Receptor		Distance to	24-hour	Background		
	Location	Land-Use	GBD (ft)	DNL	1-2 AM	3-4 AM	AVG
M1	2 Swift Terrace	Residential	750	72	46	46	46
M2	16 Neptune Circle	Residential	170	68	46	45	46
M3	Cowper Street	Residential	315	70	49	48	49

Note: The L_{eq} noise level is reported for the future estimated maximum peak-hour for bus operations at the GBD.

Airport Noise Contours

The noise levels measured in the community closest to the proposed GBD, which range from 68 dBA at Site M2 to 72 dBA at Site M1, are higher than the noise levels predicted from the Airport's noise contours. As shown in Appendix **Figure A.1**, the DNL 65 dBA noise contour cuts almost directly through the neighborhoods closest to the proposed GBD. However, since there was little to no aircraft overflights during the GBD noise monitoring program, the measured noise levels were due to other dominant noise sources in the community, particularly the MBTA Blue Line. The homes along Neptune Circle (Site M2) participated in the original Massport Residential Sound Insulation Program. Therefore, the residences along Neptune Circle are expected to have greater noise reduction than traditional home in the bedroom and other interior living spaces due to the soundproofing provided by Massport as part of the Residential Sound Insulation Program.

MBTA Noise

Due to the frequency of the train service and the proximity to the tracks, the MBTA Blue Line is the dominant noise source in the vicinity of the proposed GBD. For example, as shown in **Figure A.2**, existing noise levels drop off significantly between 1:00 and 5:30 AM, a period that coincides with the MBTA operations schedule. Although regular Blue Line service does not operate during this late night period, other MBTA maintenance trains do operate conducting rail and track inspection services. As shown in **Figure A.2**, these maintenance trains are shown in the individual spikes during these late night periods.

Other Ambient Noise

Other ambient noise sources, such as local traffic along Bennington Street and arterial traffic along Route 1A, are part of the background ambient noise levels. Except for the occasional emergency vehicles (such as police, fire or ambulance), these background noise levels are well below that of the MBTA Blue Line trains.

Other on-airport noise sources include the Sky Chef catering facility that also includes activities throughout the daytime and nighttime periods. Noise from the catering activities is more noticeable in the Swift Terrace neighborhood since the catering building partially shields the other neighborhoods along Neptune Circle and Cowper Street.

5. Modeling Methodology

The prediction of operational noise at the Massport GBD was made using several environmental noise prediction software programs including the FTA *Transit Noise* guidelines, the Federal Highway Administration's (FHWA) *Traffic Noise Model* (TNM) and SoundPLAN. The SoundPLAN model, for example, incorporates multiple variables, such as source noise levels, terrain effects, building reflections, meteorology, and ground propagation effects, and then computes the cumulative noise levels from the source at the analyzed receptors. This model also accounts for the propagation characteristics of individual sound octave band.

For the development of a GBD-specific model, nearby buildings were included to account for shielding effects, as were potential reflections occurring between hard surfaces and/or soft ground. Similarly, topographical contours for the area were used along with the proposed GBD configuration, which included building dimensions and route plans to improve the accuracy of the model. In preparing model inputs, absorptive (soft) ground was assumed for all gravel and lawn areas, and reflective (hard) ground was assumed for asphalt-paved roads. Building reflections and source directivity were also applied.

Two bus types are proposed for the GBD including the following:

- Compressed Natural Gas (CNG); and,
- Diesel-Electric Hybrid Bus that use diesel engines to regenerate the battery.

All vehicles were assumed to operate according to turning movements described in the *Final Project Definition Report*[2], and utilize volumes defined in the Bus Maintenance Yard Trip Generation table[3]. Bus passby and idling source reference levels were provided by two bus manufacturers (New Flyer and the North American Bus Industries or NABI) under consideration for CNG and diesel-electric hybrid buses. These data correlate very well with noise levels from comparable buses measured at the Massachusetts Bay Transportation Authority (MBTA) Southampton Street Bus Facility in Boston, MA on March 5, 2010. The manufacturer-provided data indicate that the 40-foot CNG bus is 4 dBA lower than the 60-foot articulated bus (58 dBA vs. 62 dBA, respectively). Similarly, the moving or accelerating noise levels range from 73 dBA for the 40-foot CNG bus to 75 dBA for the 60-foot diesel-electric hybrid bus. As part of Massport's ongoing program to utilize environmentally green technologies, 40-foot CNG buses and 60-foot articulated hybrid electric buses are proposed for the GBD. These buses are quieter and cleaner than the existing fleet. Moving, idling, and other sources are shown graphically in **Figure ES-1** and described in more detail below:

[2] Massachusetts Port Authority, "Bus Maintenance Facility: Project Definition Report", MPA #L949-D1, Boston, MA, February 11, 2010.
[3] Massachusetts Port Authority, "Southwest Service Area Redevelopment Program at Boston-Logan International Airport", East Boston, MA, February 10, 2010.

- Moving Sources (On-Site Bus Arrival and Departure Routes)
    - Bus movements along path defined by the Final Project Definition Report.
    - Other vehicle movements (e.g., Maintenance Trips, Other GBD Trips, Other CNG Fueling) were simulated with medium trucks along path defined by the *Final Project Definition Report*.
    - Passenger vehicle movements (e.g., ConRAC Driver Trips and Employee Trips) along a path from the entrance of the GBD to the main parking lot and back out.
- Idling Sources (On-Site Stationary Bus Areas)
    - For modeling purposes, all buses are estimated to idle for 20 minutes total (10 minutes each for departure [OUT] and arrival [IN] trips). This is a conservative assumption for idle time to account for possible longer idling times associated with maintenance and service activities.
        - 10 minutes in Covered Bus Storage including 5 minutes at the open ends of the building
        - 28 bus trips are predicted during the daytime period (7:00 AM to 10:00 PM)
        - 50 bus trips are predicted during the nighttime period (10:00 PM to 7:00 AM)
        - 20 bus trips are predicted during the 1:00-2:00 AM period (14 buses inbound and 6 buses outbound)
        - 3 bus trips are predicted during the 3:00-4:00 AM period (0 buses inbound and 3 buses outbound)
        - A detailed listing of the bus trips by period of the day is shown in Appendix **Table A.1**. This is the same distribution that was utilized for the ConRAC study.
    - Medium truck trips (e.g., Maintenance Trips, Other GBD Trips) estimated to idle for 5 minutes per trip in Employee Parking Lot.
    - Passenger vehicles (e.g., ConRAC Driver Trips and Employee Trips) estimated to idle for 5 minutes per trip in Employee Parking Lot (30 spaces).
- Other Sources
    - Vehicle refueling estimated to idle for 2 minutes per trip at the CNG Fuel Dispensary.
    - Bus Wash estimated to last 5 minutes.
        - 2 minutes idling
        - 3 minute of brush contact
    - Indoor bus storage building is estimated to include two roof-mounted exhaust fans operating at full capacity at all times (the size and capacity are based on typical performance needs rather than on the final selection).
    - Snorkel fans are also proposed to safely evacuate the bus exhaust during engine testing in the Maintenance Bays.

6. Operational Impact Analysis

The results of the detailed noise modeling analysis are summarized in **Table 6** (24-hour DNL results) and **Table 7** (peak-hour late night results). As shown in **Table 6**, maximum 24-hour cumulative DNL under existing conditions are predicted to range from 68 dBA at Sites R2 (residences along Neptune Circle) and R3 (residences along Cowper Street) to 72 dBA at Site R1 (residences along Swift Terrace). These noise levels are dominated primarily by idling buses and moving buses as they would exit the Shed and Barn, with only minimal contribution from bus washing, refueling and roof-top ventilation fans on the buildings. The rooftop exhaust and ventilation fans would be shielded by the Shed and Barn and be fitted with sound attenuators.

As shown in **Table 6**, the changes in the 24-hour DNL between the Existing Condition and the future Build Condition do not exceed the strictest FAA allowable increase threshold of 1.5 dB at any of the selected receptor sites. Additionally, no exceedances of either the HUD or the FTA impact criteria are predicted at any of the closest residences.

Table 6: Results of 24-hour DNL Noise Assessment at the Closest Receptors (in dBA)

ID	Name	Existing Conditions[1]	Future Project	Cumulative Noise Levels	Increase Over Existing	Evaluation Criteria	FTA "Moderate" Criteria	HUD 24-hr Criteria
R1	Swift Ter.	72	45	72	0.0	1.5	63	65
R2	Neptune Cir.	68	49	68	0.0	1.5	65	65
R3	Cowper St.	70	46	70	0.0	1.5	64	65

1 Existing noise levels were measured in March and May 2010 in the community.

As shown in **Figure 4**, the SoundPLAN model was use to predict GBD operational DNL levels around the facility and to develop noise contours. The noise contours reflect the shielding effects of the nearby structures including the adjacent buildings, the distance attenuation, atmospheric propagation, ground effects and building shielding effects.

As shown in **Table 6**, the future 24-hour day-night cumulative noise levels (L_{dn}) are the same as the Existing Conditions and are, therefore, not predicted to exceed the allowable increase criteria from the FAA. Similarly, as shown in **Table 7**, late night peak hour noise levels at 1:00 AM (during maximum facility bus activity) are also not predicted to exceed the DEP criteria of 10 decibels above the measured background. The peak hour project noise levels during the 1:00-2:00 AM period are also not predicted to exceed the City of Boston Air Pollution Control Commissions' (APCC) nighttime threshold of 50 decibels, which is primarily intended for stationary sources such as rooftop ventilation fans.

Table 7: Results of Peak-Hour (1:00 AM) Noise Assessment at the Closest Receptors (in dBA)

ID	Name	Name	Existing Conditions[1]	Future Project	DEP Criteria	Boston Nighttime Criteria
R1	Swift Terrace	Swift Terrace	46	43	56	50
R2	Neptune Cir.	Neptune1	46	45	56	50
R3	Cowper St.	Cowper St.	46	45	56	50

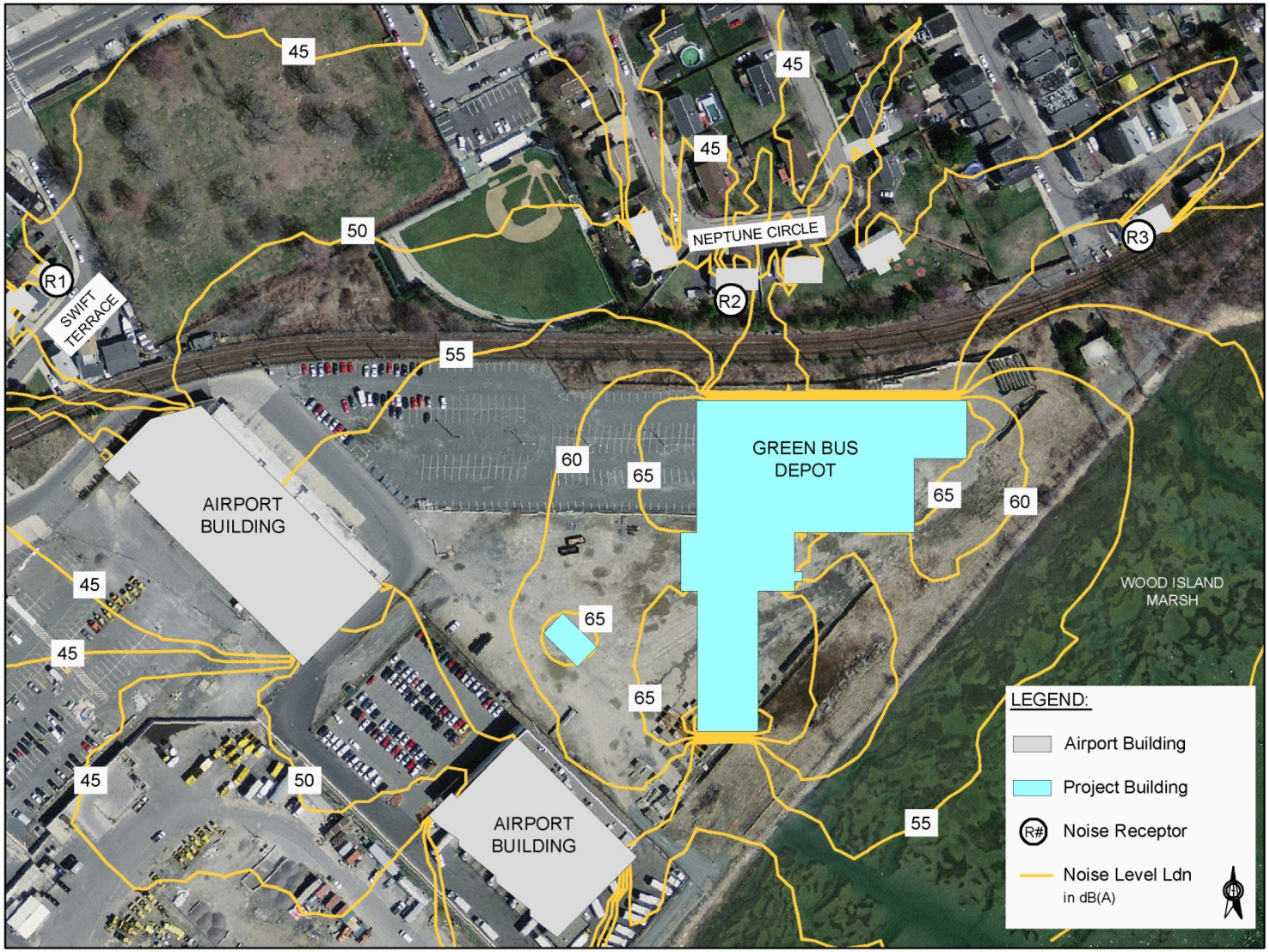
1 Existing noise levels were measured in March and May 2010 in the community.

To assess the potential for speech interference, particularly indoors, maximum instantaneous noise levels (or L_{max}) were evaluated. As shown in **Table 8**, L_{max} noise levels are predicted to range from 35 dBA indoors to 60 dBA outdoors at the closest residences along Neptune Circle. The maximum predicted noise level of 60 dBA is not predicted to exceed the FICAN limits of 70-75 dBA outdoors. Similarly, the maximum predicted interior noise level of 35 dBA is also not predicted to exceed the NC30 curve of 40 dBA used to predict the potential for noise to interfere with speech.

Table 8: Results of the Single-Event Noise Exposure – Speech Interference (in dBA)

Receptor		Exterior (façade)[1]		Interior (bedroom)		Exterior Criteria[2]	Interior Criterion[3]
ID	Name	CNG	HYB	CNG	HYB		
R1	Swift Terrace	42	44	17	19	70-75	40
R2	Neptune Circle	58	60	33	35	70-75	40
R3	Cowper Street	52	54	27	29	70-75	40

1 The maximum reference noise levels for accelerating buses (provided by the manufacturers) ranges from 73 dBA for CNG buses to 75 dBA for diesel-electric hybrid buses at 50 feet.
2 The range of noise levels associated with speech interference as reported by the Federal Interagency Committee on Aircraft Noise (FICAN) are reproduced from the CONRAC Study. These levels are assessed outdoors with an implied impact indoors assuming open windows.
3 Interior noise thresholds to assess speech interference are based on the NC30 curve for bedrooms and other quiet rooms.



Source: AECOM

Figure 4 - Maximum Predicted DNL Levels in the Vicinity of the Proposed Massport GBD Facility

7. Operational Noise Mitigation Measures

As a result of the acoustical design measures integrated into the proposed Green Bus Depot (such as the use of quieter diesel-electric hybrid buses, strategic design and layout of the GBD to shield residences from bus activities and one-directional bus flow to minimize use of back-up alarms), no exceedances of the 24-hour FAA, FTA or HUD impact criteria are predicted under the Build Alternative. Similarly, no exceedances of the peak-hourly DEP or City of Boston APCC noise limits are predicted. Finally, no exceedances of the speech interference guidelines are predicted from single noise events, such as idling or accelerating buses. Therefore, no additional noise control measures are required to achieve compliance with the federal, State and local impact criteria.

8. Construction Noise Impact

Noise levels during construction are difficult to predict and vary depending on the types of construction activity and the types of equipment used for each stage of work. Heavy machinery, the major source of noise in construction, is constantly moving in unpredictable patterns and is not usually at one location very long. Project construction activities can include foundation excavation, grading, relocating utilities, and building assembly. No heavy-duty impulsive equipment, such as pile drivers, is expected as part of the construction activities.

Massport is committed to minimize construction noise at nearby residences. Therefore, all construction activities would occur during the daytime between 7:00 AM and 6:00 PM in accordance with the City of Boston Municipal Code [Ch. 16-26.4]. Additionally, the contractor will be required to utilize construction equipment with a maximum noise level of less than 86 dBA at 50 feet in accordance with the City of Boston's Air Pollution Control Commission's (APCC) "Regulations for the Control of Noise in the City of Boston" [Regulation 3]. All construction activities would also be conducted in accordance with Massport's Standard Construction Protocols that further require the contractor to minimize noise in the community. Such noise control measures could include limiting the noisiest activities between 9:00 AM and 5:00 PM, establishing staging areas away from the residences, temporary noise barriers, electric power rather than diesel generators, well-maintained mufflers for stationary equipment and no weekend or nighttime construction.

Construction normally occurs during daylight hours when some residents are not at home and when other community noise sources (such as the MBTA Blue Line, traffic along Route 1A and aircraft activity) contribute to higher ambient noise levels. Accordingly, no significant disruption of normal activities is expected to occur as a result of construction noise.

9. References

Braunstein + Berndt GmbH/SoundPLAN LLC. January 2004. SoundPLAN User's Manual.

US Federal Aviation Administration. 2006. Order 1050.1E, Change 1,

US Federal Aviation Administration. 2006. Order 5050.4b.

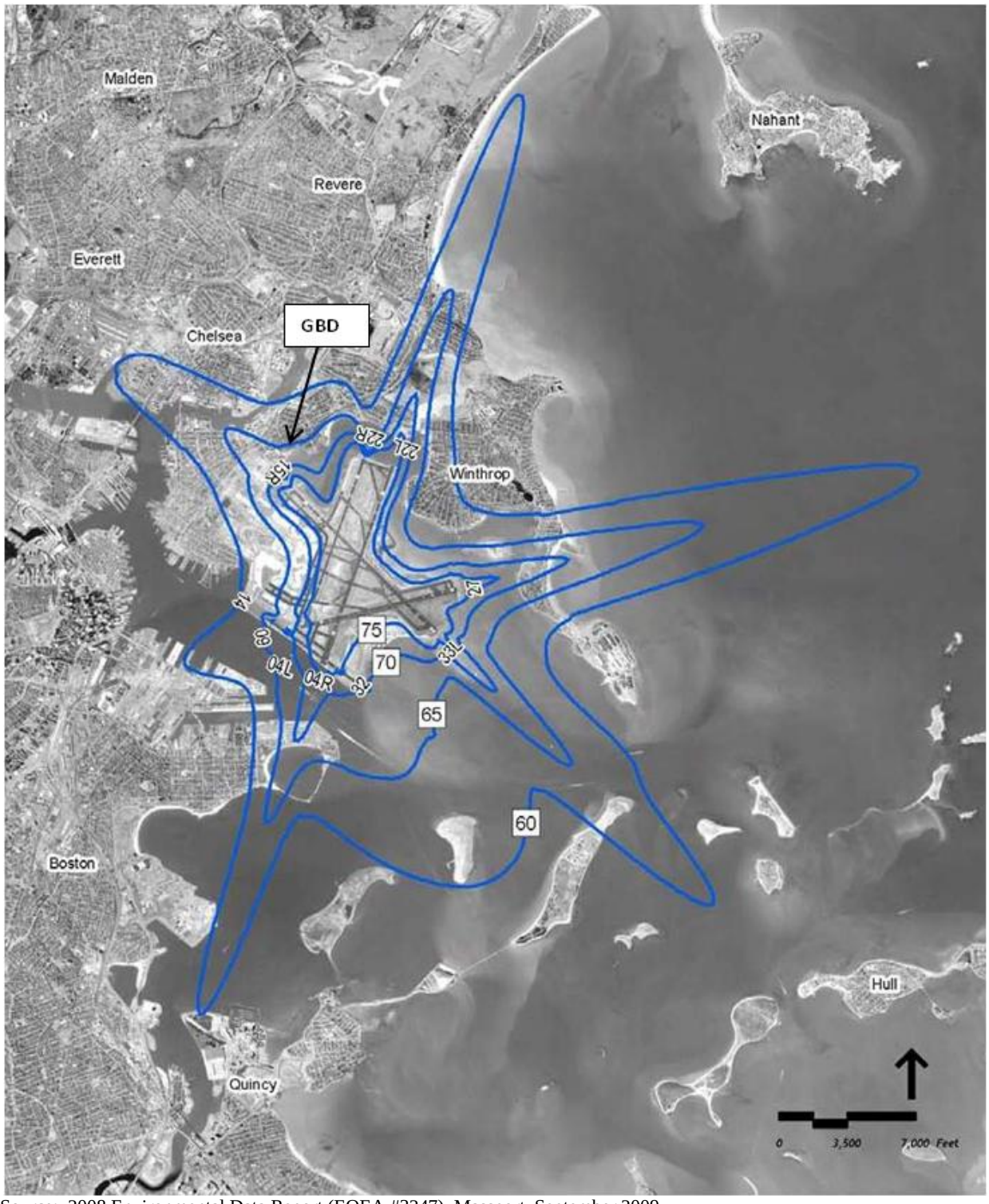
US Federal Transit Administration. May 2006. Transit Noise and Vibration Impact Assessment.

Massachusetts Department of Environmental Protection, Noise Policy, 310 CMR 7.10.

City of Boston, Air Pollution Control Commission, "Regulations for the Control of Noise in the City of Boston".

City of Boston Municipal Code, Ch. 16-26, "Unreasonable Noise"

Appendix



Source: 2008 Environmental Data Report (EOEA #3247), Massport, September 2009.

Figure A.1: Predicted 60-75 DNL Contours for 2008 Operations at Logan International Airport

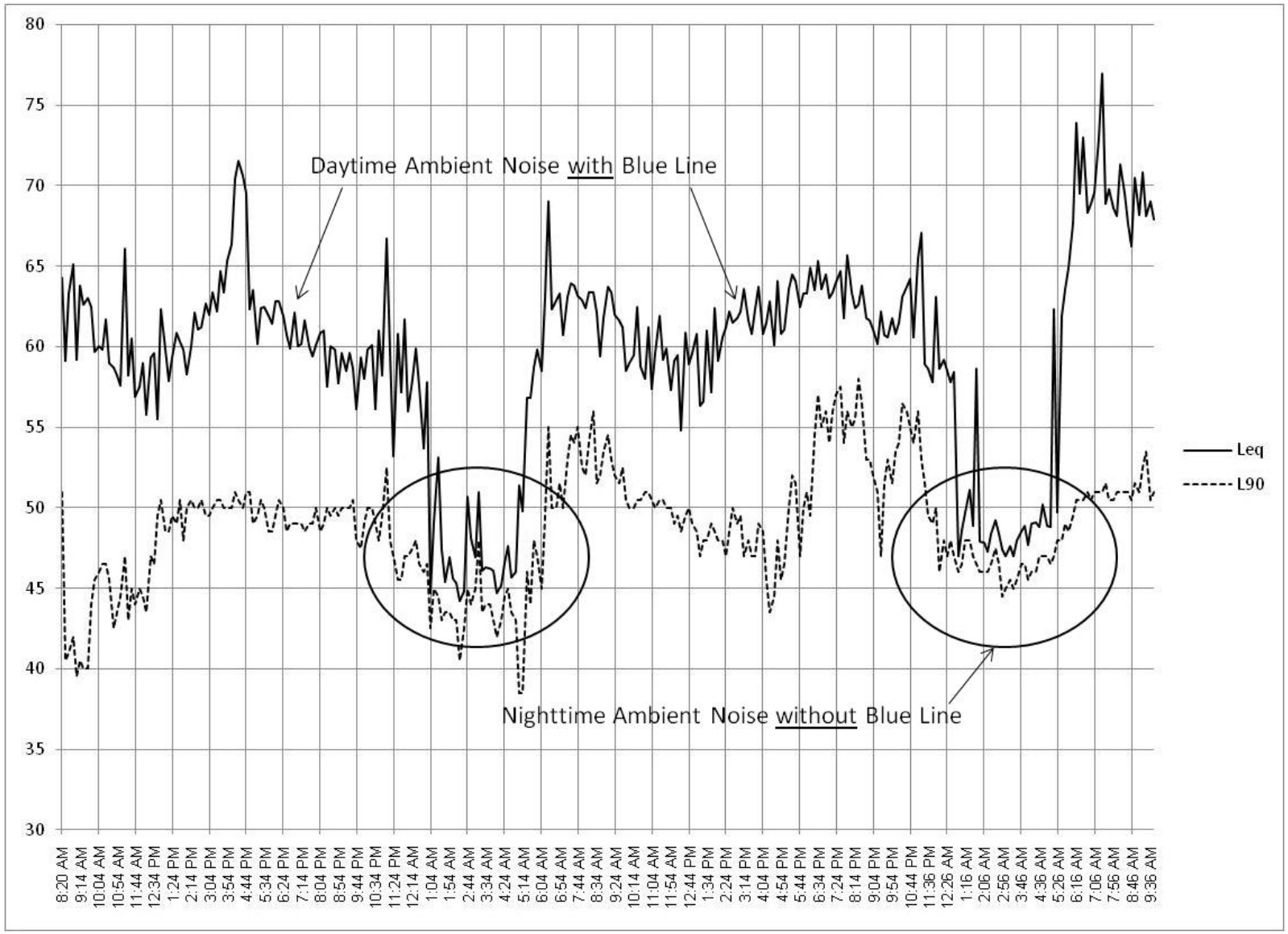


Figure A. 2: Existing Noise Levels Measured at a Residence along Neptune Circle (M1) on May 13-15, 2010.

Table A.1 - Bus Maintenance Yard Trip Generation (MASSPORT SWSA Redevelopment Project)

Time	TOTAL			Subtotal Buses		Subtotal Other Vehicles		MPA Buses		ConRAC Buses		ConRAC Driver Trips		Maintenance Trips		Employee Trips		Other BMF Trips		Other CNG Fueling	
	IN	OUT	ALL	IN	OUT	IN	OUT	IN	OUT	IN	OUT	IN	OUT	IN	OUT	IN	OUT	IN	OUT	IN	OUT
0:00:00	5	3	8	2	0	3	3	1	0	1	0	1	1	0	0	2	2	0	0	0	0
1:00:00	17	9	26	14	6	3	3	8	4	6	2	3	3	0	0	0	0	0	0	0	0
2:00:00	1	0	1	1	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0
3:00:00	0	3	3	0	3	0	0	0	3	0	0	0	0	0	0	0	0	0	0	0	0
4:00:00	0	11	11	0	7	0	4	0	5	0	2	0	0	0	0	0	4	0	0	0	0
5:00:00	3	12	15	0	9	3	3	0	3	0	6	0	0	1	1	0	0	0	0	2	2
6:00:00	8	4	12	2	0	6	4	2	0	0	0	0	0	1	1	2	0	1	1	2	2
7:00:00	7	9	16	1	3	6	6	1	0	0	3	0	0	1	1	0	0	1	1	4	4
8:00:00	13	7	20	0	0	13	7	0	0	0	0	0	0	2	2	8	2	1	1	2	2
9:00:00	7	9	16	0	2	7	7	0	0	0	2	0	0	2	2	0	0	1	1	4	4
10:00:00	8	6	14	0	0	8	6	0	0	0	0	0	0	2	2	2	0	2	2	2	2
11:00:00	6	11	17	0	5	6	6	0	3	0	2	0	0	2	2	0	0	2	2	2	2
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15:00:00	7	8	15	0	1	7	7	0	0	0	1	0	0	2	2	0	0	1	1	4	4
16:00:00	7	13	20	0	0	7	13	0	0	0	0	0	0	2	2	2	8	1	1	2	2
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18:00:00	5	6	11	1	0	4	6	1	0	0	0	0	0	1	1	0	2	1	1	2	2
19:00:00	14	7	21	7	0	7	7	1	0	6	0	3	3	1	1	0	0	1	1	2	2
20:00:00	8	4	12	0	0	8	4	0	0	0	0	0	0	1	1	4	0	1	1	2	2
21:00:00	5	4	9	1	0	4	4	1	0	0	0	0	0	1	1	0	0	1	1	2	2
22:00:00	11	6	17	5	0	6	6	0	0	5	0	3	3	1	1	0	0	0	0	2	2
23:00:00	4	3	7	1	0	3	3	1	0	0	0	0	0	1	1	0	0	0	0	2	2
	170	**170**	**340**	**39**	**39**	**131**	**131**	**18**	**18**	**21**	**21**	**12**	**12**	**29**	**29**	**20**	**20**	**20**	**20**	**50**	**50**

NOTES:

1 CNG fueling other than buses estimated at 50 vehicles per day by MPA. Hourly distribution based on Frankfort/Lovell traffic volumes

2 In-service bus trips include existing routes at current scheduling, and Unified Bus System (ConRAC-MBTA) buses at scheduling/volumes per FEIR patterns

3 Distribution of In-service bus trips assume all routes begin/end at airport terminals.

4 "Employee Trips" include driver trips and assume daily administrative/maintenance staff of 10 persons, plus 4-person cleaning crew.

5 "Maintenance Trips" include 2-4 trips per hour day and evening associated with maintenance (parts delivery, vehicle testing, service calls)

6 "Other BMF Trips" include 2-4 daytime trips per hour for miscellaneous errands, vendors, training, etc.

7 Distribution of "Other BMF Trips" based on existing patterns at Lovell Street/Frankfort Street intersection

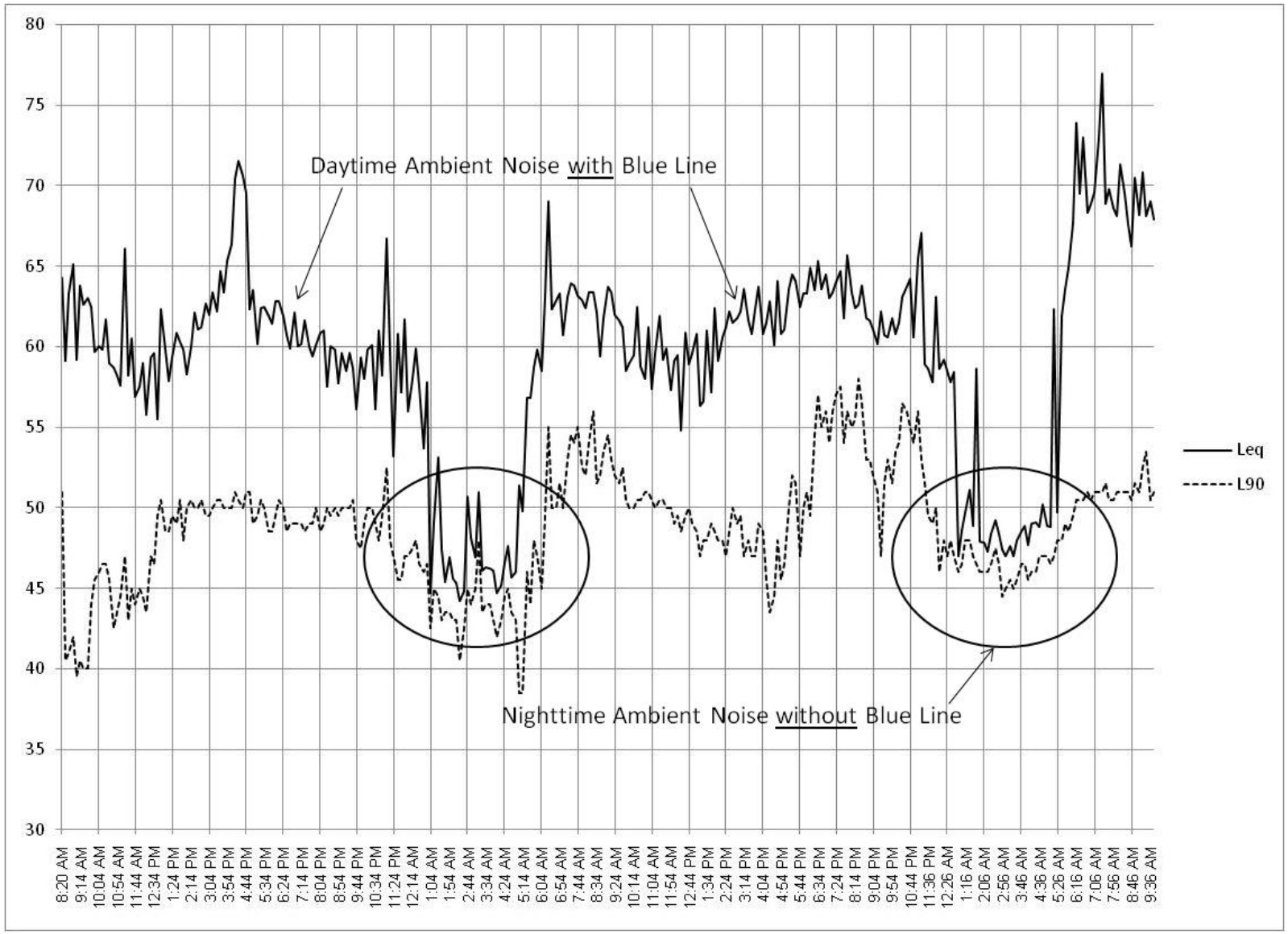

Figure A. 2: Existing Noise Levels Measured at a Residence along Neptune Circle (M1) on May 13-15, 2010.

Table A.1 - Bus Maintenance Yard Trip Generation (MASSPORT SWSA Redevelopment Project)

Time	TOTAL			Subtotal Buses		Subtotal Other Vehicles		MPA Buses		ConRAC Buses		ConRAC Driver Trips		Maintenance Trips		Employee Trips		Other BMF Trips		Other CNG Fueling	
	IN	OUT	ALL	IN	OUT	IN	OUT	IN	OUT	IN	OUT	IN	OUT	IN	OUT	IN	OUT	IN	OUT	IN	OUT
0:00:00	5	3	8	2	0	3	3	1	0	1	0	1	1	0	0	2	2	0	0	0	0
1:00:00	17	9	26	14	6	3	3	8	4	6	2	3	3	0	0	0	0	0	0	0	0
2:00:00	1	0	1	1	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0
3:00:00	0	3	3	0	3	0	0	0	3	0	0	0	0	0	0	0	0	0	0	0	0
4:00:00	0	11	11	0	7	0	4	0	5	0	2	0	0	0	0	0	4	0	0	0	0
5:00:00	3	12	15	0	9	3	3	0	3	0	6	0	0	1	1	0	0	0	0	2	2
6:00:00	8	4	12	2	0	6	4	2	0	0	0	0	0	1	1	2	0	1	1	2	2
7:00:00	7	9	16	1	3	6	6	1	0	0	3	0	0	1	1	0	0	1	1	4	4
8:00:00	13	7	20	0	0	13	7	0	0	0	0	0	0	2	2	8	2	1	1	2	2
9:00:00	7	9	16	0	2	7	7	0	0	0	2	0	0	2	2	0	0	1	1	4	4
10:00:00	8	6	14	0	0	8	6	0	0	0	0	0	0	2	2	2	0	2	2	2	2
11:00:00	6	11	17	0	5	6	6	0	3	0	2	0	0	2	2	0	0	2	2	2	2
12:00:00	8	8	16	0	0	8	8	0	0	0	0	0	0	2	2	0	0	2	2	4	4
13:00:00	8	9	17	0	1	8	8	0	0	0	1	0	0	2	2	0	0	2	2	4	4
14:00:00	7	11	18	0	2	7	9	0	0	0	2	0	0	2	2	0	2	1	1	4	4
15:00:00	7	8	15	0	1	7	7	0	0	0	1	0	0	2	2	0	0	1	1	4	4
16:00:00	7	13	20	0	0	7	13	0	0	0	0	0	0	2	2	2	8	1	1	2	2
17:00:00	11	7	18	4	0	7	7	1	0	3	0	2	2	2	2	0	0	1	1	2	2
18:00:00	5	6	11	1	0	4	6	1	0	0	0	0	0	1	1	0	2	1	1	2	2
19:00:00	14	7	21	7	0	7	7	1	0	6	0	3	3	1	1	0	0	1	1	2	2
20:00:00	8	4	12	0	0	8	4	0	0	0	0	0	0	1	1	4	0	1	1	2	2
21:00:00	5	4	9	1	0	4	4	1	0	0	0	0	0	1	1	0	0	1	1	2	2
22:00:00	11	6	17	5	0	6	6	0	0	5	0	3	3	1	1	0	0	0	0	2	2
23:00:00	4	3	7	1	0	3	3	1	0	0	0	0	0	1	1	0	0	0	0	2	2
	170	**170**	**340**	**39**	**39**	**131**	**131**	**18**	**18**	**21**	**21**	**12**	**12**	**29**	**29**	**20**	**20**	**20**	**20**	**50**	**50**

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7 Distribution of "Other BMF Trips" based on existing patterns at Lovell Street/Frankfort Street intersection

Appendix C Air Quality Technical Report

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Air Quality Technical Report

Green Bus Depot

Prepared for:

Massachusetts Port Authority
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July 2010

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Executive Summary

An air quality assessment was conducted to document the potential impacts associated with the construction and operation of Massport's proposed Green Bus Depot (GBD). The detailed air quality analysis addresses two main project-level related air quality issues:

1. localized air quality impact around the new GBD facility through a concentration dispersion modeling assessment for the relevant localized criteria pollutants using an Environmental Protection Agency (EPA) screening model, and
2. the change in area-wide emissions including greenhouse gases (GHG) through a comparison of overall emission levels under baseline and proposed future conditions.

The study evaluated impacts and benefits from the proposed facility using several metrics including project-level carbon monoxide (CO) and particulate matter ($PM_{2.5}$ and PM_{10}), greenhouse gas (GHG) emissions, hazardous air pollutants (HAPs) including mobile source air toxics (MSAT) and ultra fine particulates (UFP), and regional emissions of ozone (O_3) by looking at the precursors including nitrogen oxides (NO_x) and volatile organic compounds (VOCs). Additionally, a general conformity determination was prepared to demonstrate that emissions fall below the federal *de minimis* threshold limits.

The results of the prediction modeling indicate that there are no significant air quality impacts associated with the GBD development. In general, the same bus trips would occur along the airport roadway network independent of the project and there would be a trip reduction between the airport and the existing off-airport maintenance facility. Therefore, the proposed action would result in a positive air quality impact with an overall reduction in emissions between the No Action and Build Conditions.

Furthermore, by implementing energy-saving LEED® Green Building design features, overall emissions from the GBD are expected to be below those of a conventional building. The design features selected to minimize the emissions from the maintenance facility include the following elements and activities:

- The entire facility (including the green building materials and the layout) are designed to minimize energy usage and thereby minimize pollutant emissions;
- Off-airport bus maintenance trips to the Chelsea repair and maintenance facility would be eliminated reducing emissions due to Massport bus vehicle miles traveled (VMT) to and from the storage and repair facility by 49 percent and reducing off-airport emissions by 100 percent;
- As a result of energy and operating efficiencies, the GBD will have a minimum of 20 percent lower GHG emissions than a traditional building;
- Compressed natural gas (CNG) and diesel-electric hybrid buses produce significantly lower emissions than comparable diesel buses;
- The diesel-electric hybrid buses would utilize ultra low sulfur diesel (ULSD) in combination with diesel particulate filters (DPF) to reduce particulate emissions, for example, by over 95 percent compared with traditional diesel engines; and,
- The diesel-electric hybrid buses retrofit with DPF emissions control technologies would also eliminate over 95 percent of all ultra fine particulate matter.

Localized concentrations of CO and PM were calculated for all on-airport activities, including idling and moving buses as well as boiler emissions. No exceedances of the National Ambient Air Quality Standards (NAAQS) or the Massachusetts Department of Environmental Protection (DEP) significant impact levels (SIL) are predicted from on-airport operations. Impacts at congested on-airport intersections are also expected to be well below the NAAQS since the worst-case or most congested intersections would operate at level of service (LOS) 'C' or better[1].

Since the airport is in an O_3 nonattainment area in the northeast ozone transport region (OTR) and a CO maintenance area, area-wide annual emissions of volatile organic compounds (VOC), oxides of nitrogen (NOx) and CO were compared with the federal *de minimis* limits of 100 tons per year (tpy) for NOx and CO and 50 tpy for VOC to demonstrate compliance with Section 176 of the General Conformity Rule (GCR). Future emissions for the nonattainment ozone precursors (VOC and NOx) and CO (the project is located in an EPA-designated CO maintenance area) are predicted to be well below the *de minimis* thresholds, even assuming all emissions resulting at the new facility would be new emissions. Therefore no formal conformity determination is required and potential air quality impacts would not be significant.

Greenhouse gas emissions for the facility, estimated at 669 total metric tons during construction and 540 annual metric tons during operations, are predicted to be well below the federal threshold of 25,000 metric tons recommended by the Council of Environmental Quality (CEQ) in February 2010 for disclosure purposes [CEQ, whitehouse.gov, 2/18/10]. Additionally, the GBD is also predicted to reduce GHG emissions approximately 30 percent by utilizing CNG and diesel-electric hybrid buses rather than traditional diesel buses. Finally, the GBD would also reduce vehicle miles traveled (VMT) to and from the maintenance facility by almost 50 percent between the No Build baseline and the Build Conditions. As a result, the GBD (while not required as part of an ENF) is expected to comply with the Massachusetts Environmental Policy Act's (MEPA) recently-revised *Greenhouse Gas Policy and Protocol* [May 5, 2010].

Since the GBD would include a fleet of CNG and diesel-electric hybrid-powered buses rather than the traditional diesel buses, the proposed facility would not be a significant source of MSAT.

There are no federal standards addressing emissions of ultra fine particulates (UFP). However, several studies indicate that UFP are virtually eliminated with diesel particulate filters (DPF) and diesel oxidation catalysts (DOC) that also utilize ULSD fuel. Additionally, since only 60 percent of the bus fleet includes diesel-electric hybrid buses that utilize smaller diesel engines, UFP emissions would be reduced even further. Particulate emissions (and UFP) from CNG bus engines with catalyst or other clean fleet technologies are reduced by over 90 percent compared to standard diesel engines [EPA].

[1] LOS 'C' or better indicates free flow traffic while LOS 'D, E or F' indicates congestion.

1. Introduction

A new Green Bus Depot (GBD) is proposed in the North Service Area (NSA) of Boston's Logan International Airport. The proposed GBD would provide Massport with the necessary on-airport facilities to maintain a new fleet of clean-fuel shuttle buses (including diesel-electric hybrid and compressed natural gas) and to accommodate the new Unified Bus System that will serve Logan's new consolidated Rental Car Facility (EEA# 14137). This report describes the project level air quality impact analysis conducted in support of the ENF for the proposed GBD. The results of this report demonstrate compliance with the ambient air quality standards and general conformity rule requirements from the construction and operation of the proposed GBD. The analysis includes the following:

- Operational impact analysis including off-airport bus operational impact discussion and on-airport GBD operational impact analysis.
- General conformity rule applicability analysis of construction and operational nonattainment pollutant emissions.
- Construction and operational criteria pollutant emissions and GHG emissions estimates.

2. Regulatory Guidance and Implication

2.1 Pollutants of Concern

Air pollution is of concern because of its demonstrated effects on human health. Public awareness of the effects of air pollution has increased noticeably in recent years. This is evidenced by the passage of the Clean Air Act in 1970 and subsequent major Amendments in 1977 and 1990. Of special concern are the respiratory effects of the pollutants, as well as their general toxic effects. The pollutants that are most important for a highway air quality impact analysis are those that can be traced principally to motor vehicles. These air pollutants are listed here, along with a description of their potential health effects.

Ozone (O_3) is a strong oxidizer and a pulmonary irritant that affects the respiratory mucous membranes, other lung tissues, and respiratory functions. Exposure to ozone can impair the ability to perform physical exercise, can result in symptoms such as tightness in the chest, coughing, and wheezing, and can ultimately result in asthma, bronchitis, and emphysema. Motor vehicles do not emit ozone directly. Emissions of volatile organic compounds (VOC) and nitrogen oxides (NOx), which are the precursor pollutants to ozone formation, react in the presence of sunlight to form ozone in the atmosphere. These reactions occur over periods of hours to days during atmospheric mixing and transport downwind. Accordingly, ozone and its precursors VOC and NOx are regulated at the regional level as part of the Boston Region Metropolitan Planning Organization's (MPO) long range transportation plan (LRTP).

Carbon Monoxide (CO) is a colorless and odorless gas, which is a product of incomplete combustion. CO is absorbed by the lungs and reacts with hemoglobin to reduce the oxygen carrying capacity of the blood. At low concentrations, CO has been shown to aggravate the symptoms of cardiovascular disease. It can cause headaches and nausea, and at sustained high concentration levels, can lead to coma and death. CO concentrations are not related to ozone

levels. CO concentrations tend to be highest in localized areas because they are most affected by local traffic congestion, since motor vehicles are a major source of CO emissions.

Particulate matter (PM_{10} and $PM_{2.5}$) is made up of small solid particles and liquid droplets. PM_{10} refers to particulate matter with an aerodynamic diameter of 10 microns and smaller, and $PM_{2.5}$ refers to particulate matter with an aerodynamic diameter of 2.5 microns and smaller. Particulates enter the body by way of the respiratory system. Particulates over 10 microns in size are captured in the nose and throat and are readily expelled from the body. Particles smaller than 10 microns, and especially particles smaller than 2.5 microns, can reach the air ducts (bronchi) and the air sacs (alveoli). Particulates, especially $PM_{2.5}$, have been associated with increased incidence of respiratory diseases such as asthma, bronchitis, and emphysema; cardiopulmonary disease; and cancer. The majority of PM emissions from mobile sources are attributed to diesel vehicles.

Sulfur dioxide (SO_2) is a gas that is formed during the combustion of fuels containing sulfur compounds. It can cause irritation and inflammation of tissues with which it comes into contact. Inhalation can cause irritation of the mucous membranes causing bronchial damage, and it can exacerbate pre-existing respiratory diseases such as asthma, bronchitis, and emphysema. Exposure to SO_2 can cause damage to vegetation, corrosion to metallic materials, and soiling of clothing and buildings. Due to the implementation of EPA's Ultra-Low Sulfur Diesel Fuel Requirements taking effect since 2006, SO_2 is not expected to be a concern as a result of the project.

Lead (Pb) is no longer considered to be a pollutant of concern for transportation projects. The major source of lead emissions to the atmosphere had been from motor vehicles burning gasoline with lead-containing additives. However, lead emissions have been nearly eliminated with the conversion to unleaded gasoline nationwide.

Mobile Source Air Toxics (MSAT) are a subset of the 188 air toxics defined by the Clean Air Act. Most air toxics originate from human-made sources, including on-road mobile sources, non-road mobile sources (e.g., locomotives, airplanes), area sources (e.g., dry cleaners) and stationary sources (e.g., factories or refineries). In 2001, the EPA indentified 21 air toxics in its full list of MSATs, and identifies seven of those as primary MSATs. The seven primary MSATs are napthalene, acrolein, benzene, 1-3 butadiene, formaldehyde, polycyclic organic matter (POM) and diesel particulate matter plus diesel exhaust organic gases (DPM+DEOG). Some toxic compounds are present in fuel and are emitted to the air when the fuel evaporates or passes through the engine unburned. Other toxics are emitted from the incomplete combustion of fuels or as secondary combustion products. Metal air toxics also result from engine wear or from impurities in oil, diesel fuel, or gasoline. There currently are no established ambient air quality standards for MSATs.

Additionally, ultrafine particles (UFPs), with their nanoscale dimensions, are the main constituent of airborne particulate matter. Due to their quantity and ability to penetrate deep within the lung, UFPs are a concern for respiratory exposure and health. However, UFP risk assessment research is still in the very early stages. There are continuing debates about whether to regulate UFPs and how to research and manage the health risks they may pose. The EPA has not yet regulated or fully researched ultrafine particles and therefore a detailed regulatory analysis of potential UFPs impact cannot be conducted.

2.2 Criteria Pollutants and National Ambient Air Quality Standards

The United States Environmental Protection Agency (EPA), under the requirements of the 1970 Clean Air Act (CAA), as amended in 1977 and 1990, has established National Ambient Air Quality Standards (NAAQS) for six contaminants, referred to as criteria pollutants (40 Code of Federal Regulations [CFR] 50): carbon monoxide (CO), nitrogen dioxides (NO_2), ozone (O_3) (with nitrogen oxides [NO_x] and volatile organic compounds [VOCs] as precursors), particulate matter (PM) (PM_{10}—less than 10 microns in particle diameter; $PM_{2.5}$—less than 2.5 microns in particle diameter), lead (Pb), and sulfur dioxide (SO_2).

On January 22, 2010, EPA announced a new hourly NO_2 standard of 100 parts per billion (ppb). The final rule for the new hourly NAAQS was published in the Federal Register on February 9, 2010, and the standard is effective on April 12, 2010.

On June 3, 2010, EPA also issues the new 1-hour SO_2 standard. At the same time, EPA revoked the previous standards, 40 ppb evaluated over 24 hours and 30 ppb evaluated over a year, and set a 1-hour health standard at 75 ppb instead. In order to implement the new standard, new monitoring requirements mandate that monitors be placed where SO_2 emissions impact populated areas. States will need to make adjustments to the existing monitoring network in order to ensure that monitors meeting the network design regulations for the new 1-hour SO_2 standard are sited and operational by January 1, 2013. The EPA plans to use modeling as well as monitoring to determine compliance with the new standard, and areas not meeting the new standard will be identified and designated by June 2012.

The NAAQS include primary and secondary standards as listed in **Table 1**. The primary standards were established to protect human health. Typical sensitive land uses protected by the primary standards are public accessible areas used by these populations, such as residences, hospitals, libraries, churches, parks, playgrounds, schools, etc. Secondary standards set limits to protect the environment, including plants and animals, from adverse effects associated with pollutants in the ambient air.

2.3 Attainment Status

Areas where ambient concentration levels are below the NAAQS for a criteria pollutant are designated as being in "attainment." Areas where a criteria pollutant level equals or exceeds the NAAQS are designated as being in "nonattainment." Based on the severity of the pollution problem, nonattainment areas are categorized as marginal, moderate, serious, severe, or extreme for O_3. Additionally, areas that were formerly in nonattainment and are currently under a maintenance program are considered maintenance areas. Where insufficient data exists to determine an area's attainment status, it is designated as either unclassifiable or in attainment.

Massport's proposed Green Bus Depot at Logan International Airport's North Service Area would be constructed in East Boston, Massachusetts, which is an area currently designated as an attainment area for all criteria pollutants except ozone. The area is also considered a CO maintenance area (a former CO nonattainment area).

Table 1
National and Massachusetts Air Quality Standards

Pollutant and Averaging Time	Primary Standard[1]	Secondary Standard[1]
Carbon Monoxide		
1-Hour Maximum[2]	35 ppm	None
8-Hour Maximum[2]	9 ppm	
Nitrogen Dioxide		
Annual Arithmetic Mean[3]	100 µg/m3	100 µg/m3
1-Hour 98th Percentile Over 3 Years	0.1 ppm (189 µg/m3)	None
Ozone		
8-Hour Average[4]	0.075 ppm	0.075 ppm
Particulate Matter[5]		
PM_{10}		
24-Hour Average[6]	150 µg/m3	150 µg/m3
$PM_{2.5}$		
Annual Arithmetic Mean[3]	15 µg/m3	15 µg/m3
24-Hour Average[7]	35 µg/m3	35 µg/m3
Lead		
Quarterly Arithmetic Mean[8]	1.5 µg/m3	1.5 µg/m3
Rolling 3-Month Average[9]	0.15 µg/m3	0.15 µg/m3
Sulfur Dioxide		
Annual Arithmetic Mean[3]	0.03 ppm (80 $\mu g/m^3$)	—
24-Hour Maximum[2]	0.14 ppm (365 $\mu g/m^3$)	—
3-Hour Maximum[2]	—	0.5 ppm (1300 $\mu g/m^3$)
1-Hour 99th Percentile over 3 Years	0.075 ppm—	

Legend: — = not available; ppm = parts per million.
Notes:
[1] All concentrations in micrograms per cubic meter of air ($\mu g/m^3$), except where noted.
[2] Not to be exceeded more than once a year.
[3] Not to be exceeded during any calendar year.
[4] Standard attained when 3-year average of annual 4th-highest daily maximum 8-hour concentration is below 0.075 ppm.
[5] PM_{10}: particulate matter diameter of 10 microns or less; $PM_{2.5}$: particulate matter diameter of 2.5 microns or less.
[6] Not to be exceeded more than once per year on average over 3 years.
[7] Standard attained when the annual highest 98th percentile of 24-hour concentration over 3 years is below 35 $\mu g/m^3$.
[8] The quarterly lead standard is not to be exceeded during any calendar quarter.
[9] Any three-month average exceeding 0.15 $\mu g/m^3$ within a three-year period will be considered a violation of the NAAQS. Final rule signed October 15, 2008.
Sources: 40 CFR 50.

2.4 Current Ambient Air Quality in the Region

The DEP's Air Assessment Branch (AAB) monitors air quality to ensure that the Commonwealth of Massachusetts meets and maintains national air quality health standards. The DEP also develops and implements plans and programs to meet and maintain federal and Commonwealth air quality standards.

This section summarizes measured ambient air quality data for the region including the Logan International Airport. The DEP maintains an area wide network of 28 monitoring stations that routinely measure pollutant concentrations in the ambient air. These stations provide data to assess compliance with the NAAQS and to evaluate the effectiveness of pollution control strategies. The relevant monitored pollutants are O_3, NO_2, CO, PM, and SO_2. **Table 2** presents the maximum concentrations for these pollutants measured at representative monitoring station sites closest to the study area, as reported by the DEP to the EPA for the three most recent years for which data are available (2006 – 2008). There is only one monitoring station in East Boston on Bremen Street; the other closest air quality monitoring stations operated by DEP are in South Boston, Roxbury and Long Island.

Table 2
Recent Monitored Ambient Air Quality in the Region

Criteria	Averaging		2006		2007		2008	
Pollutant	**Period**	**NAAQS**	**1st Max**	**2nd Max**	**1st Max**	**2nd Max**	**1st Max**	**2nd Max**
Carbon Monoxide (CO)	1-hour	35 ppm	3.5	3.0	2.0	2.0	1.5	1.5
	8-hour	9 ppm	2.1	1.7	1.3	1.2	1.1	0.9
	Site	--	Harrison Avenue (Roxbury)					
Nitrogen Dioxide (NO_2)	1-hour	0.1 ppm	0.157	0.099	0.075	0.064	0.076	0.063
	Annual	0.053 ppm	0.014	--	0.02	--	0.016	--
	Site	--	531a East First Street (South Boston)					
Ozone (O_3)	8-hour	0.075 ppm	0.083	0.083	0.082	0.08	0.083	0.073
	Site	--	Long Island					
	8-hour	0.075 ppm	0.075	0.07	0.081	0.08	0.066	0.065
	Site	--	Harrison Avenue (Roxbury)					
Sulfur Dioxide (SO_2)	1-hour	0.075 ppm	0.044	0.034	0.036	0.034	0.027	0.024
	3-hour	0.03 ppm	0.033	0.02	0.029	0.027	0.023	0.021
	24-hour	0.14 ppm	0.015	0.013	0.014	0.014	0.017	0.013
	Annual	0.5 ppm	0.004	--	0.005	--	0.005	--
	Site	--	340 Bremen Street (East Boston)					
Particulate Matter ($PM_{2.5}$)	24-hour	35 µg/m^3	37.3	29.8	39	31.7	28.1	28
	Annual	15 µg/m^3	9.69	--	10.48	--	10.08	--
	Site	--	Harrison Avenue (Roxbury)					
Particulate Matter (PM_{10})	24-hour	150 µg/m^3	38	32	40	24	28	27
	Site	--	Harrison Avenue (Roxbury)					

Source: U.S. Environmental Protection Agency AIRData website (http://www.epa.gov/air/data/geosel.html).

As shown in **Table 2**, the eight-hour O_3 concentrations at monitoring stations on Long Island and Harrison Avenue in Roxbury exceeded the new limit of 0.075 ppm in each of the previous three years. The full observed data for 2009 is not available yet. However, the 24-hour PM_{10} concentration at the Harrison Avenue monitoring station did not exceed the criterion limit of 150 $\mu g/m^3$ in any of the previous three years. Recent concentrations of $PM_{2.5}$, however, are reported to exceed the new more stringent 24-hour standard of 35 $\mu g/m^3$ during each of the previous three years. Although the new one-hour NO_2 was exceeded once in 2006, this new standard has not been exceeded since then at the South Boston monitoring station. All of the other pollutants, including CO, are reported to be well below their respective standards.

2.5 General Conformity Rule

The 1990 amendments to the CAA (Clean Air Acts Amendments (CAAA)) require federal agencies to ensure that their actions conform to the State Implementation Plan (SIP) in a nonattainment or a maintenance area. Conformity to an SIP, as defined in the CAAA, means reducing the severity and number of violations of the NAAQS to achieve attainment of the standards. The federal agency responsible for an action is required to determine whether its action conforms to the applicable SIP. EPA has developed two sets of conformity regulations—for transportation projects and non-transportation-related projects, respectively:

- Transportation projects developed or approved under the Federal Aid Highway Program or Federal Transit Act are governed by transportation conformity regulations (40 CFR Parts 51 and 93), that became effective December 27, 1993 and were revised August 15, 1997.

- Non-transportation projects are governed by general conformity regulations (40 CFR Parts 6, 51, and 93), described in the final rule for Determining Conformity of General Federal Actions to State or Federal Implementation Plans, published in the Federal Register on November 30, 1993. The General Conformity Rule (GCR) became effective January 31, 1994 and has been recently revised on March 24, 2010.

Since the proposed action would occur at Logan International Airport, an O_3 nonattainment area and a CO maintenance area, the general conformity rule is considered applicable because the Federal Aviation Administration (FAA) has approval authority on the airport-wide layout plan. Under the general conformity rule, a project is in conformity if it corresponds to a SIP's purpose of eliminating or reducing the severity and number of violations of the NAAQS and achieving expeditious attainment of such standards. Conformity further requires that such activities NOT:

(1) Cause or contribute to any new violations of any standards in any area.
(2) Increase the frequency or severity of any existing violation of any standard in any area.
(3) Delay timely attainment of any standard or any required interim emission reductions or other milestones in any area.

The conformity analysis for a federal action examines the impacts of the direct and indirect net emissions from mobile and stationary sources. Direct emissions are emissions of a criteria pollutant or its precursors that are caused or initiated by a federal action and occur at the same time and place as the action. Indirect emissions, occurring later in time and/or further removed

in distance from the action itself, must be included in the determination if both of the following apply:

- The federal agency can practicably control the emissions and has continuing program responsibility to maintain control.
- The emissions caused by the federal action are reasonably foreseeable.

To focus general conformity requirements on those federal actions with the potential to have significant air quality impacts, threshold (*de minimis*) rates of emissions were established in the final rule. A formal conformity determination is required when the annual net total of direct and indirect emissions from a federal action, occurring in a nonattainment or maintenance area, equals or exceeds an annual *de minimis* level. **Table 3** lists the *de minimis* level by pollutant.

For CO maintenance areas, the GCR establishes *de minimis* emission levels of 100 tons per year (tpy). For O_3 nonattainment areas, the GCR establishes *de minimis* emission levels for both O_3 precursors, VOC and NO_x, on the presumption that VOC and NO_x reductions will contribute to reductions in O_3 formation. Since the project site is located in an O_3 moderate nonattainment area in an OTR, the *de minimis* level of 100 tons per year (tpy) of NO_x and 50 tpy of VOC apply.

Table 3
***De Minimis* Emission Levels for Criteria Air Pollutants**

Pollutant	Nonattainment Designation	*De Minimis* (Tons/Year)
Ozone*	Serious	50
	Severe	25
	Extreme	10
	Other nonattainment or maintenance areas outside ozone transport region	100
	Marginal and moderate nonattainment areas inside ozone transport region	50/100**
Carbon Monoxide	All	100
Sulfur Dioxide	All	100
Lead	All	25
Nitrogen Dioxide	All	100
Particulate Matter ≤ 10 microns	Moderate	100
	Serious	70
Particulate Matter ≤ 2.5 microns***	All	100

Notes: * Applies to ozone precursors – volatile organic compounds (VOCs) and nitrogen oxides (NO_X).
** VOCs/NO_X
*** Applies to PM2.5 and its precursors.

2.6 Climate Change and Greenhouse Gas Emissions

In addition to criteria pollutants, greenhouse gases (GHGs) emissions were also considered in this report for NEPA disclosure purposes by following the Draft NEPA Guidance on Consideration of the Effects of Climate Change and Greenhouse Gas Emissions issued by the Council of Environmental Quality (CEQ) in February 2010. As the proposed action is anticipated to release GHGs to the atmosphere, these emissions are quantified and disclosed for each activity of the proposed action.

GHGs are compounds that contribute to the greenhouse effect. The greenhouse effect is a natural phenomenon where gases trap heat within the surface-troposphere (lowest portion of the earth's atmosphere) system, causing heating (radiative forcing) at the surface of the earth. The primary long-lived GHGs directly emitted by human activities are carbon dioxide (CO_2), methane (CH_4), nitrous oxide (N_2O), hydrofluorocarbons (HFCs), perfluorocarbons (PFCs), and sulfur hexafluoride (SF_6). These gases influence the global climate by trapping heat in the atmosphere that would otherwise escape to space. The heating effect from these gases is considered the probable cause of the global warming observed over the last 50 years. Global warming and climate change can affect many aspects of the environment. Not all effects of GHGs are related to climate, for example, elevated concentrations of CO_2 can lead to ocean acidification and stimulate terrestrial plant growth, and CH_4 emissions can contribute to ozone levels.

The EPA Administrator has recognized potential risks to public health or welfare and on December 7, 2009 signed an endangerment finding regarding greenhouse gases under Section 202(a) of the Clean Air Act (CAA), which finds that the current and projected concentrations of the six key well-mixed greenhouse gases in the atmosphere threaten the public health and welfare of current and future generations.

As per CEQ's *Draft NEPA Guidance on Consideration of the Effects of Climate Change and Greenhouse Gas,* 25,000 metric tons or more of GHG emissions increase is considered an indicator that as a quantitative and qualitative assessment may be meaningful to decision makers and the public. This threshold was used in this report as an indicator of a potential meaningful impact on GHG emissions subsequent climate change from the proposed action.

3. Analysis Methodology

3.1 Project-related Emission Sources

3.1.1 Off-Airport Mobile Source Operations

The implementation of the Proposed Action would change traffic patterns slightly along the on-airport access road network due to the construction of the GBD. The primary bus-related mobile source air pollutants are CO, PM, NO_x, and volatile organic compounds (VOCs, precursors of O_3).

3.1.2 On-Airport Stationary and Mobile Source Operations

With the GBD in operation, on-airport operational activities with potential to result in air emissions include:

- Heating boilers.
- Bus maneuvering and idling during parking, refueling, and routine maintenance.

The combustion processes of these sources would result in localized air emissions with potential impact on the sensitive receptors in the vicinity of the GBD. Thus, an air quality impact modeling assessment was performed to evaluate the quantity and potential effects of the facility emissions.

3.1.3 Construction Activities

Increased direct and indirect emissions from mobilization, construction, and operational activities would result from the following short-term activities:

- Use of diesel-powered construction equipment.
- Movement of trucks containing debris and construction materials.
- Construction-workers commute.
- Boilers.
- Bus and other vehicle movements.

3.2 Emission Inventory and Emission Rate Estimates

It should be noted that the methodology used for predicting proposed facility emissions inventory relies on the available regulatory planning tools as compared to using the fuel consumption records that are normally available and used for existing facilities. These planning tools are commonly used in preparing an environmental impact analysis document as per the NEPA requirement.

3.2.1 Operational Sources

3.2.1.1 Vehicles

For the purpose of estimating vehicle emissions within the GBD, fuel and vehicle types assumed for each identified vehicle types are summarized below:

- -MPA bus: diesel, diesel-electric hybrid, and CNG.
- ConRAC bus: CNG and diesel-electric hybrid.
- ConRAC driver and employee vehicles: gasoline auto.
- Maintenance and other GBD vehicles: diesel trucks.
- CNG fueling vehicles: CNG trucks.

Vehicle emissions were calculated for both traveling and idling operations associated with the hourly and daily trips included in the ConRAC Study (**Table 4**). A Detailed hourly trip profile for each vehicle type is provided in the appendix (see **Table A-1**).

Table 4
Vehicle Trip Estimates

Time Period	MPA Buses		ConRAC Buses		ConRAC Driver Trips		Maintenance Trips		Employee Trips		Other GBD Trips		Other CNG fueling	
	IN	OUT	IN	OUT	IN	OUT	IN	OUT	IN	OUT	IN	OUT	IN	OUT
Max Hourly[1]	8	4	6	2	3	3	0	0	0	0	0	0	0	0
Total Daily	18	18	21	21	12	12	29	29	20	20	20	20	50	50

1 The maximum hourly (Max Hourly) bus trips are predicted to occur from 1:00-2:00 AM. As a result, this period was selected to represent the peak-hour period even though it does not represent the maximum period for other vehicle types.

EPA Mobile6.2 emission factor input files provided by DEP (Woleader, March 5, 2010) were used to calculate traveling and idling emission rates. Traveling emission rates in grams per mile were multiplied by the estimated trip length to get the traveling emissions in grams per vehicle per time period. The travel distance for each round trip was estimated to be 5.6 miles. It was conservatively assumed that buses would idle an average of ten (10) minutes (or five minutes upon arrival and before departure), including potential idling time during repairs, and all other vehicles would idle an average of five (5) minutes onsite. Both traveling and idling emission rates in grams per second were then calculated for maximum hourly and daily time periods by multiplying the amount of vehicle trips within the respective time duration (hourly or daily). The emission factors and estimated traveling and idling emission rates are provided in **Tables A-2 through A-13** in Appendix A.

3.2.1.2 Boilers

As described in the Project Definition Report, boilers will be installed for the following buildings:

- Administration building.
- Maintenance building.
- Shops.
- Enclosed bus storage (Bus Barn).

The future buildings are assumed to be heated by natural gas-fired boilers. Each building is assumed to be adequately heated with a heating value of 30 British Thermal Units (BTU) per hour (hr) per square foot plus 20 percent as a safety factor. Maximum hourly emission rates in grams per second were then calculated based on the U.S. EPA-provided AP-42 emission factors

for a natural-gas-burning boiler. Estimated emission rates are presented in **Tables A-14 through A-18** in Appendix A.

3.2.2 Construction Sources

The construction activities are assumed to take place over three years beginning from 2010 and ending in 2012. However, since construction activities may or may not occur during the same year this analysis conservatively assumes all construction activities occur during one year.

Under the Proposed Action, Massport is proposing to construct the following buildings as part of the GBD:

- Administration Building.
- Maintenance Building.
- Shops.
- Enclosed Bus Storage (Bus Barn).
- Covered Bus Storage (Bus Shed).
- Bus Wash.
- Covered Fueling.

Increased direct and indirect emissions from mobilization, construction, and operational activities would result from the following activities:

- Use of diesel-powered construction equipment.
- Movement of trucks containing debris and construction materials.
- Construction-workers commute.
- Boilers.
- Bus and other vehicle movements.

In estimating emissions, the usage of equipment and the duration of activities for construction and operational activities were first estimated. The increased emissions were then calculated using the EPA guidance and emission factor models and documents.

Estimates as to construction crew and equipment requirements and productivity are based on data presented in *2003 RSMeans Facilities Construction Cost Data*, R.S. Means Co., Inc., 2002.

Specific information regarding the sizes of specific construction elements and types of construction are based on the available information described in the Project Definition Report, and engineering judgment.

3.2.2.1 Construction Equipment Operations and Emissions

In the emissions estimates, all construction equipment was assumed to be diesel-powered. The pieces of equipment to be used include, but are not limited to:

- Concrete saws.
- Compressor.
- Various cranes.
- Various dozers.

- Excavator.
- Gas fence post auger.
- Gas engine vibrator.
- Gas welding machine.
- Gradall.
- Grader.
- Hydraulic hammer.
- Various loaders.
- Various pumps.
- Various rollers.

The equipment listed above is reflective of maximum equipment requirements, and is not necessarily reflective of equipment needed on any given day. The length of time any particular piece of equipment is required is ultimately a function of the final construction schedule. For the purposes of calculating emissions, the precise scheduling and the actual number of pieces of each equipment type is not a critical factor; rather, the total operating hours for each piece of equipment is the relevant metric.

A variable that may significantly alter emissions calculations is the final selection of equipment. The equipment list presented above, and the equipment days and hours that are required were predicted based on the crew-types identified in RS Means, 2003, which reflects the equipment necessary to complete each individual task. For efficiency, the contractor is likely to minimize the number of different pieces of equipment necessary.

Estimates of equipment emissions were based on the estimated hours of usage and emission factors for each motorized source for the project. Emission factors related to heavy-duty diesel equipment were predicted by EPA NONROAD emission factor model (EPA, December 2008). These emission factors are based on the model default parameters and do not reflect any clean construction initiative necessarily.

Emission factors in grams of pollutant per hour per horsepower were multiplied by the estimated running time and equipment associated average default horsepower established in NONROAD model. Finally, the total grams of pollutant were converted to tons of pollutant.

The EPA recommends the following formula to calculate hourly emissions from NONROAD engine sources including cranes, backhoe, etc.:

$$M_i = N \times HP \times LF \times EF_i$$

where:

M_i = mass of emissions of i^{th} pollutants during inventory period;
N = source population (units);
HP = average rated horsepower;
LF = typical load factor; and
EF_i = average emissions of i^{th} pollutant per unit of use (e.g., grams per horsepower-hour).

3.2.2.2 Motor Vehicle Operations and Emissions

Construction truck and commuting vehicle operations would result in indirect emissions. However, the on-airport truck activities were considered negligible due to the volume of material transported in and out of the site. Moreover, the only activities that are subject to the general conformity determination are vehicle operations within the project site over which the federal

agency (i.e., FAA) has control. Motor vehicle operations within the site are assumed and summarized as follows:

- Each worker's commuter vehicle and on-airport truck running time would be equivalent to taking a 20-minute round trip at an average speed of 25 mph.

Emission factors for motor vehicles were determined for commuter vehicles (modeled as light duty gasoline vehicles) and trucks (modeled as heavy duty diesel trucks) using the EPA Mobile6 mobile source emission factor model associated with the model input parameters provided by DEP. These emission factors were then multiplied by the vehicle operational hours to determine motor vehicle annual emissions.

3.3 Impact Dispersion Modeling

3.3.1 Off-Airport Mobile Source Operations

The project-level air quality impacts of a traffic-related action are generally evaluated on two scales:

- Microscale level for CO and PM (PM10 and PM2.5). A microscale (also referred as a hot-spot) analysis of traffic-related impacts at intersections or free flow sites provides estimates of localized pollutant concentrations for direct comparison to the NAAQS and/or applicable impact thresholds.

- Mesoscale level for NOx and VOCs. As precursors of ozone, (O3), NOx and VOCs, are usually of regional concern in nonattainment areas for O3. Potential emission increases from additional vehicle miles traveled (VMT) may affect regional O3 levels. However, since O3 is a problem of regional concern and subject to air transport phenomena under different weather conditions, O3-related impacts are generally evaluated on a regional basis by the appropriate regional Metropolitan Planning Organization (MPO) using regional ozone airshed model(s). This type of mesoscale analysis is generally not conducted on a project-by-project basis and is not necessary for this impact analysis.

3.3.1.1 CO Hot Spot Impact Analysis

One of the major concerns associated with on-road vehicle operations is CO exhaust. CO is considered a site-specific pollutant with higher concentrations found adjacent to roadways, especially near congested, signalized intersections. Mobile source CO air quality impacts are typically evaluated through a microscale analysis of traffic-related emissions at selected intersections. Procedures outlined by EPA in *A Modeling Methodology for Predicting Pollutant Concentrations Near Roadway Intersections* (EPA September 1995) were used as the basis to evaluate potential localized traffic-related CO impact for this study.

According to the EPA CO hot spot analysis guidance, a screening evaluation (based upon the traffic analysis) can be performed to identify which intersections within the project area are most congested and would be most affected by the Proposed Action. Sites were considered to fail the screening evaluation if the level of service (LOS) decreases below D under the proposed action

as compared to the existing conditions, or if the delay and/or volume increase from the existing conditions to the Proposed Action causing a LOS below D at the worst-case intersections. If such conditions occur, CO impacts can then be estimated for receptor locations at the worst-case intersections. However, according to the *Environmental Notification Form (ENF)* for the *Economy Parking Consolidation Project* (Massport, February 15, 2005), which predicted future overall airport access roadway traffic impacts in the vicinity of the GBD, the LOS at each affected intersection would be C or better with the GBD. The *Economy Parking Consolidation Project*, which included on-access road bus trips generated from the GBD, predicted no net increase in bus trips under the proposed GBD Build Condition as compared to existing condition. Therefore, no further microscale hot spot impact modeling analysis is warranted and the traffic-related CO impacts from the GBD would not be significant under the Proposed Action condition.

3.3.1.2 PM and MSAT Impact Analysis

On 10 March 2006, the EPA issued a Final Rule regarding the localized or "hot-spot" analysis of particulate matter ($PM_{2.5}$ and PM_{10}). This rule requires that $PM_{2.5}$ hotspot analysis be performed only for transportation projects with significant increase in diesel traffic in areas not meeting $PM_{2.5}$ air quality standards. The project area is classified as an attainment area for PM_{10} and $PM_{2.5.}$ As such, an access road hotspot PM analysis is not required and potential mobile source PM impact can be considered negligible. Moreover, the hot spot diesel PM (as part of MSAT) was also considered unnecessary because hot-spot modeling of PM is not recommended as per the EPA's 2006 Conformity Rule. Specifically, from 71 FR 12498:

> "We continue to believe that appropriate tools and guidance are necessary to ensure credible and meaningful PM2.5 and PM10 hot-spot analyses. Before such analyses can be performed, technical limitations in applying existing motor vehicle emission factor models must be addressed, and proper federal guidance for using dispersion models for PM hotspot analysis must be issued. With the release of MOBILE6.2, state and local transportation agencies now have an approved model for estimating regional PM2.5 and PM10 emission factors in SIP [State Implementation Plan] inventories and regional emissions analyses for transportation conformity. However, MOBILE6.2 has significant limitations that make it unsatisfactory for use in microscale analysis of PM2.5 and PM10 emissions as necessary for quantitative hot-spot analysis."

Since the same bus trips would occur along the airport roadway network independent of the project and there would be a trip reduction between the airport and the existing off-airport maintenance facility, the proposed action would result in a positive MSAT impact. Therefore, no MSAT emissions analysis is warranted.

3.3.2 On-Airport Stationary and Mobile Source Operations

Although EPA has recently issued a 1-hour NAAQS for both 98^{th} percentile NO_2 and 99^{th} percentile SO_2, the procedures to make attainment designation for individual area and/or modeling guidelines are still in a developing process. The EPA Air Quality Modeling Group (AQMG) has received several inquiries regarding the use of the AERMOD model tool in relation to the new hourly NO_2 and SO_2 standards; specifically, how AERMOD can be applied to calculate impacts for comparison to the new standard. At this time, AQMG is not considering modifying AERMOD to accommodate the form of the new 1-hour standard, but will be

developing a more generic AERMOD post-processor to address this need. The AERMOD post-processor to be developed will also have the capability of calculating the design values for other criteria pollutants, as well as generating statistics that may meet a wider range of current and future needs. While the generic AERMOD post-processor is being developed, AQMG will develop a more limited AERMOD postprocessor for use on an interim basis. Based on the lack of post-processor to evaluate the new 1-hour standard, the project-level 1-hour NO_2 and SO_2 impact analysis cannot be conducted appropriately at this time.

However, a screening analysis using the SCREEN3 dispersion model was performed to screen impacts from both boiler and bus emissions generated at the GBD. According to 40 CFR Part 51 *Revision to the Guideline on Air Quality Models* (9 November 2005), SCREEN3 is the current screening model used in the Guideline. SCREEN3 is a conservative screening model capable of predicting hourly maximum downwind concentrations using the worst-case meteorological conditions for each criteria pollutant. Given the variety of emission points and areas within the GBD particularly those for moving and idling bus emissions generated around each facility and the mixing of pollutants caused by those proposed building structures, three area sources (shown in **Figure 1**) were used in the modeling analysis including:

- Area 1: sources within and around bus storage barn.
- Area 2: sources around administration building and shops.
- Area 3: sources along other bus travel loops, around and within maintenance building and refueling station.

Potential source emissions within each area were approximated as evenly distributed and conservatively assumed to be released from ground level. This approach is particularly considered conservative for boiler emissions. Each area source was modeled separately, and the worst-case concentration levels at the worst-case receptor locations (i.e., the closest receptor to the barn) from each area source were combined to determine the total concentration levels at that receptor shown in **Figure 1**. SCREEN3 output file printouts are shown in Appendix B. The predicted hourly concentrations were then multiplied by the EPA-defined screening persistent factors to determine 3-hr, 8-hr, 24-hour, and annual average concentrations in order to reflect the variation of hourly meteorological conditions within each averaging period. For 1-hr NO_2 concentration levels, a factor of 0.75 recommended by EPA for modeling purposes was used to convert estimated NO_x to NO_2 emissions, which were used in order to predict hourly NO_2 concentration levels.

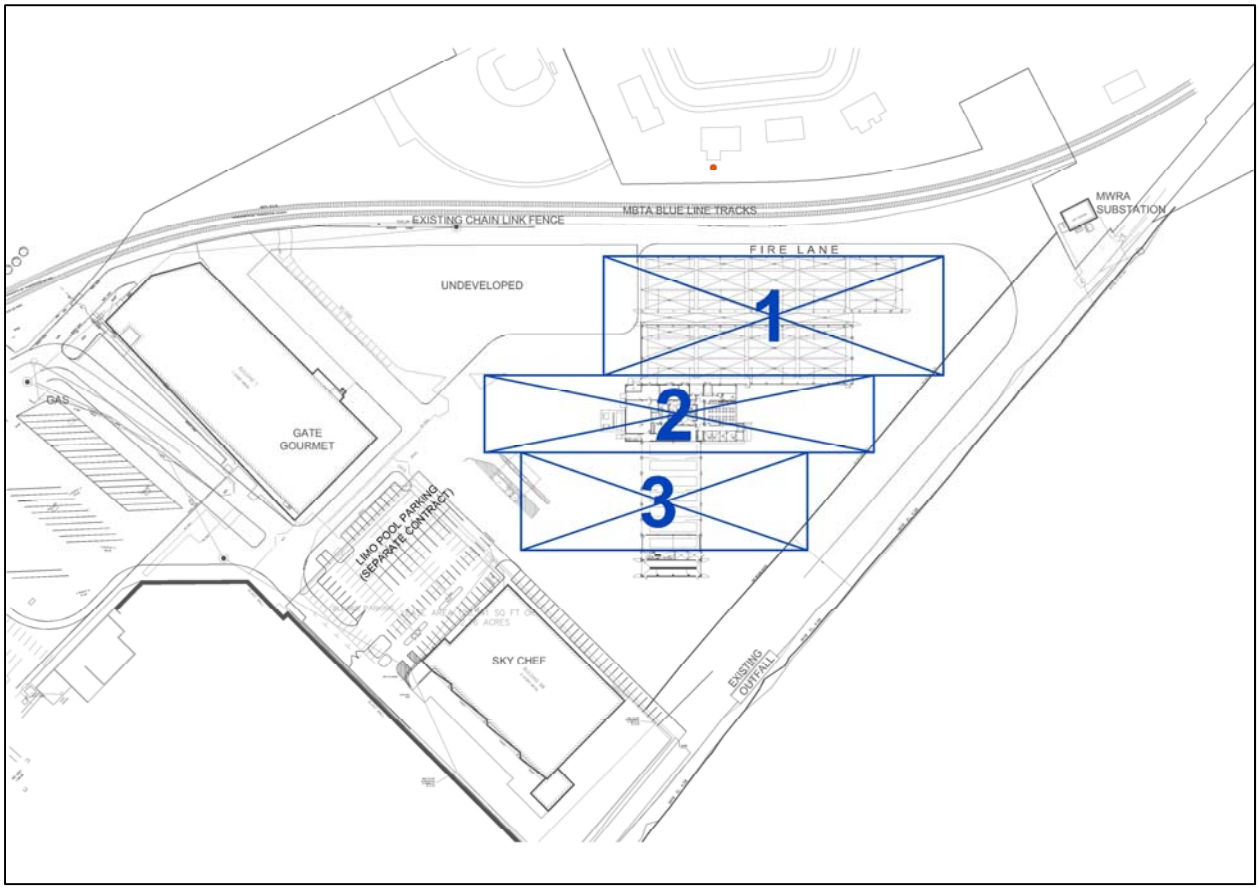

Figure 1 Site Plot Plan with Modeled Air Quality Emission Source Areas

Existing ambient air quality conditions in the vicinity of the airport can be inferred from air quality measurements conducted at air quality monitoring stations close to the airport. The most recent available data from the nearby monitoring station in the Boston area were used to describe the existing ambient air quality background conditions at the airport. The worst-case 1-hour 3-year average 98th percentile background NO_2 level was provided by DEP for South Boston. These levels were further used as the background concentration levels to conservatively determine potential cumulative total concentration levels at the worst-case receptor locations and subsequently compare with the NAAQS to evaluate potential GBD air quality impact significance.

3.4 Greenhouse Gas Forecasts

In accordance with the recently-updated MEPA *Greenhouse Gas Policy and Protocol*, GHG emissions were estimated for both the Baseline and the Build Condition. The Baseline Condition represents traditional energy usage while the Build Condition represents the measures undertaken by the project sponsor to reduce GHG emissions through the selection of materials and products. To estimate total GHG emissions, each GHG is assigned a global warming potential (GWP). The GWP is the ability of a gas or aerosol to trap heat in the atmosphere. The GWP rating system is standardized to CO_2, which has a value of one. For example, CH_4 has a GWP of 21, which means that it has a global warming effect 21 times greater than CO_2 on an

equal-mass basis (Intergovernmental Panel on Climate Change [IPCC], 2007). To simplify GHG analyses, total GHG emissions from a source are often expressed as CO_2 equivalents (CO_2 Eq). The CO_2 Eq is calculated by multiplying the emissions of each GHG by its GWP and adding the results together to produce a single, combined emission rate representing all GHGs. While CH_4 and N_2O have much higher GWPs than CO_2, CO_2 is emitted in much higher quantities, so that it is the overwhelming contributor to CO_2 Eq from both natural processes and human activities. GWP-weighted emissions are presented in terms of equivalent emissions of CO_2, using units of teragrams (1 million metric tons or 1 billion kilograms) of carbon dioxide equivalents (Tg CO_2 Eq). The total GHG emissions in terms of CO_2 Eq under the proposed action were predicted for the same source activities for which criteria pollutant emissions were estimated.

Among the primary long-lived GHGs directly emitted by human activities, only CH_4 and N_2O have potential to be produced from fossil fuel combustion sources (EPA, April 15, 2009).

Most of the EPA tools that are widely used for NEPA study purposes (e.g., AP-42, NONROAD and MOBILE6 emissions factor models) do not provide emission factors for CO_2 Eq other than for CO_2. Therefore, given the lack of regulatory tools to provide reasonable estimates of CO_2 Eq, this report utilizes the inventory ratios among CO_2, CH_4 and N_2O summarized in the most recent EPA inventory report (EPA, April 15, 2009) as the basis for approximating and prorating CH_4 and N_2O emission levels. This approach was concurred by the EPA (Cook, March 4, 2010) particularly given the lack of fuel consumption records for a proposed action facility as compared to an existing facility.

The 2007 inventory data (EPA 2009b) shows that CO_2, CH_4, and N_2O contributed from fossil fuel combustion process from mobile and stationary sources include approximately:

- 5,736 teragrams (Tg) (or million metric tons) of CO_2
- 9 Tg CH_4
- 45 Tg N_2O

The ratios among CO_2, CH_4 and N_2O based on above inventory levels were used to predict CH_4 and N_2O equivalencies from mobile and stationary combustion sources as follows:

CH_4 = (tons per year [TPY] of CO_2) * (9 / 5,736) = 0.16% TPY of CO_2.

N_2O = (TPY of CO_2) * (45/ 5,736) = 0.78% TPY of CO_2.

Based on these ratios, the GHG contribution from CH_4 and N_2O is less than 1% of the total CO_2 equivalency for fossil fuel combustion sources.

Moreover, because CO_2 emissions were estimated in the unit of short tons due to the unit used for available emission factors, the CO_2 Eq level in terms of metric ton was derived by converting the short ton to the metric ton using the factor of 0.90718.

3.5 Baseline and Future Conditions

The operating emissions for the Baseline and Future Conditions were developed based on the operating characteristics of the existing off-airport maintenance facility. The following differences were considered between the baseline and future conditions to determine the net change of emissions resulting from the proposed action:

Baseline Condition

- ConRAC buses are powered by diesel fuel and MPA buses are CNG buses.
- Facility is heated by diesel-powered boilers over approximately 32,000 square feet (ft^2).
- The round-trip travel distance to and from the off-airport maintenance and storage facility in Chelsea is approximately 2.4 miles excluding travel miles along on-airport travel loops.

Future Condition

- Buses consist of 60% diesel-electric hybrid and 40% CNG (32 and 18 buses, respectively).
- Facility will be heated by natural gas-powered boilers over approximately 51,000 ft^2.
- Travel distance to and from the proposed GBD would be approximately 1.3 miles excluding travel miles along on-airport travel loops.

4. Analysis Results

4.1 Emissions Inventory

4.1.1 Construction Phase

The estimated emissions, equipment types and operational hours expected for the construction activities are summarized in **Table 5**. The truck and commuting vehicular emission factors were multiplied by the vehicle operational hours to determine motor vehicle annual emissions during the construction period. The predicted construction emissions for the GBD are summarized in **Table 6**.

4.1.2 Operational Phase

The operating emissions for the Baseline and Future Conditions reflect the sources operational characteristics for the existing off-airport maintenance facility and the proposed GBD. The differences considered include those described previously in Section 3.5 (Baseline and Future Conditions).

Table 5
Annual Construction Equipment Emissions

Equipment Type/Activity	No. of Units	Total Hours	Horsepower (hp)	Load Factor (%)	Emission Factor (grams/hp-hour)							Total Emission Rate (tons)						
					VOC	NOx	CO	PM_{10}	$PM_{2.5}$	SO_2	CO_2	VOC	NOx	CO	PM_{10}	$PM_{2.5}$	SO_2	CO_2
Asphalt paver,	1	30	130	59	0.38	4.59	2.07	0.36	0.35	0.12	550	0.001	0.012	0.005	0.001	0.001	0.000	1.394
Backhoe loader	1	360	48	21	1.47	6.80	6.42	1.01	0.98	0.14	662	0.006	0.027	0.026	0.004	0.004	0.001	2.647
Compressor, 250 cfm	1	450	83	43	0.54	5.42	2.40	0.44	0.43	0.12	573	0.010	0.096	0.042	0.008	0.008	0.002	10.115
Concrete pump, small	1	180	53	43	0.75	6.18	3.03	0.57	0.56	0.12	567	0.003	0.028	0.014	0.003	0.002	0.001	2.548
Concrete saw	1	30	48	59	0.58	5.11	3.74	0.59	0.58	0.13	591	0.001	0.005	0.003	0.001	0.001	0.000	0.547
Crane, 90-ton	1	180	231	43	0.35	5.14	1.30	0.25	0.24	0.11	533	0.007	0.101	0.026	0.005	0.005	0.002	10.486
Crane, SP, 12 ton	2	900	231	43	0.35	5.14	1.30	0.25	0.24	0.11	533	0.035	0.506	0.128	0.025	0.024	0.011	52.432
Diesel hammer, 41k ft-lb	1	90	116	43	0.44	1.60	5.23	0.32	0.31	0.12	546	0.002	0.008	0.026	0.002	0.002	0.001	2.710
Dozer	1	120	75	21	1.47	6.80	6.42	1.01	0.98	0.14	662	0.003	0.014	0.013	0.002	0.002	0.000	1.379
Dozer	1	90	300	21	1.47	6.80	6.42	1.01	0.98	0.14	662	0.009	0.042	0.040	0.006	0.006	0.001	4.136
Fence post auger, gas	1	60	8	55	13.43	2.88	710.02	0.11	0.11	0.22	1057	0.004	0.001	0.194	0.000	0.000	0.000	0.289
Front end loader, 1.5 cy	1	90	94	21	1.47	6.80	6.42	1.01	0.98	0.14	662	0.003	0.013	0.013	0.002	0.002	0.000	1.289
Front end loader, 2.5cy	1	30	94	21	1.47	6.80	6.42	1.01	0.98	0.14	662	0.001	0.004	0.004	0.001	0.001	0.000	0.430
Gas engine vibrator	1	6	55	68	26.08	2.78	696.11	0.18	0.17	0.22	1093	0.006	0.001	0.161	0.000	0.000	0.000	0.252
Gas welding machine	1	570	17	68	11.35	3.24	642.74	0.11	0.10	0.21	996	0.084	0.024	4.750	0.001	0.001	0.002	7.362
Gradall, 3 ton, 1/2 cy	1	120	171	59	0.32	4.25	1.64	0.29	0.28	0.12	541	0.004	0.057	0.022	0.004	0.004	0.002	7.228
Grader, 30,000 lb	1	90	204	59	0.32	4.26	1.45	0.28	0.27	0.12	537	0.004	0.051	0.017	0.003	0.003	0.001	6.423
Hydraulic excavator	1	120	171	59	0.32	4.25	1.64	0.29	0.28	0.12	541	0.004	0.057	0.022	0.004	0.004	0.002	7.228
Hydraulic hammer,1200lb	1	30	176	43	0.57	6.68	2.36	0.43	0.42	0.12	539	0.001	0.017	0.006	0.001	0.001	0.000	1.345
Paving machinery & equipment	1	30	70	59	0.47	5.00	2.64	0.44	0.42	0.12	556	0.001	0.007	0.004	0.001	0.001	0.000	0.754
Pneumatic wheel roller	1	30	92	59	0.42	4.77	2.49	0.41	0.40	0.12	559	0.001	0.009	0.004	0.001	0.001	0.000	1.005
Roller, vibratory	1	90	92	59	0.42	4.77	2.49	0.41	0.40	0.12	559	0.002	0.026	0.013	0.002	0.002	0.001	3.016
Rollers, steel wheel	1	30	92	59	0.42	4.77	2.49	0.41	0.40	0.12	559	0.001	0.009	0.004	0.001	0.001	0.000	1.005
Total Annual Average Emissions												**0.19**	**1.12**	**5.54**	**0.08**	**0.08**	**0.03**	**126.02**

Table 6
Construction Motor Vehicle Emissions

Activity		Hours Of Operation	Emission Factor (lbs/hr)							Emissions (tons)						
			VOC	NO_x	CO	PM_{10}	$PM_{2.5}$	SO_2	CO_2	VOC	NO_x	CO	PM_{10}	$PM_{2.5}$	SO_2	CO_2
Truck Emissions																
Total trucks =	31															
Total working days =	250	15430	0.02	0.32	0.11	001	0.01	0.02	77.15	0.19	2.44	0.84	0.09	0.08	0.13	595.2
Running hrs per veh per day =	2															
Commuter Vehicle Emissions																
Total vehicles =	8															
Total working days =	250	690	0.02	0.02	0.68	0.0014	0.0006	0.0004	24.45	0.01	0.01	0.24	0.00	0.00	0.00	8.4
Minutes on site round trip =	20															
Total Construction Vehicle Emissions										**0.20**	**2.45**	**1.08**	**0.09**	**0.08**	**0.13**	**603.6**

4.1.2.1 On-Airport Bus Operational Emissions

The change in on-airport bus operational emissions at the GBD on an annual basis is summarized in **Tables 7 and 8** for baseline and future conditions, respectively.

4.1.2.2 Off-airport Roadway Bus Emissions Reduction

Between the baseline condition and the future condition under the proposed action, the benefit of switching from a mix of CNG and diesel-powered existing bus operations to the CNG and diesel-electric hybrid bus operations was not considered because it has already been accounted for in the Southwest Service Area (SWSA) or Consolidated Rental Car Facility (ConRAC) study. However, the change in fuel type for bus operations within the GBD was considered in this study. In addition to the benefit of changing bus type, a reduction of overall bus running emissions along the bus routes between the airport and the existing maintenance facility would also be achieved under the proposed action because of the elimination of the off-airport maintenance facility.

The length of roadway segments for arrival and departure bus trips for the existing maintenance facility are approximately 2.4 miles under the existing/baseline condition and 1.3 miles under the proposed condition. Based on an average of 39 round trips for the MPA and ConRAC buses on a daily basis (see **Table A-1** in the **Appendix**), the reduction of average annual emissions was estimated and summarized in **Table 9**, assuming an average travel speed of 30 miles per hour. The emission factors applicable for Urban Transit Buses established in EPA's MOBILE6.2 model and the CNG CO_2 emission factors provided in the "Emission Testing of Washington Metropolitan Area Transit Authority (WMATA) Natural Gas and Diesel Transit Buses" report (National Renewable Energy Laboratory, December 2005) were used in the estimate.

4.1.2.4 Facility Boiler Emissions

The estimate of operational activity annual emissions was conducted similarly to those methods described in Chapter 2 for on-airport stationary/mobile sources. The estimated annual operational emissions are summarized in **Table 10** for boilers under both baseline and proposed conditions.

4.1.3 Combined Emissions Inventory

Combined emissions inventory is presented in **Table 11** which includes the emissions predicted under both construction and operational phases. The operational emissions were estimated for both baseline and future conditions. Based on the emission levels between the baseline and the proposed condition, it can be concluded that the GBD project would achieve a net reduction in emissions of the majority of the criteria pollutants with positive air quality effects. For the boiler, however, emissions of CO and PM are predicted to increase slightly under the Build Condition compared with the baseline condition to heat the new facility, which is 60 percent larger than the existing facility (51,000 ft^2 compared to 32,000 ft^2 in Chelsea).

Table 7
Baseline On-Airport Vehicle Operational Emissions

Operation																			
Stage	No. of days	Veh/Day[1]	Distance Traveled[2] (mi)	Fleet Usage (%)	Diesel to Hybrid Fuel Usage Ratio[2]	Emission Factor (g/mi)							Emissions (tpy)						
						VOC	NO_x	CO	PM_{10}	$PM_{2.5}$	SO_2	CO_2	VOC	NO_x	CO	PM_{10}	$PM_{2.5}$	SO_2	CO_2
Cars (LDGV)	365	64	0.225	100%	NA	0.44	0.37	12.50	0.02	0.01	0.01	368.10	0.00	0.00	0.07	0.00	0.00	0.00	2.13
Trucks (HDDV)	365	98	0.225	100%	NA	0.44	5.75	1.98	0.22	0.18	0.30	1399.70	0.00	0.05	0.02	0.00	0.00	0.00	12.42
Trucks (HDGV-NGV)	365	100	0.225	100%	NA	0.21	1.22	3.84	0.06	0.04	0.00	-	0.00	0.01	0.03	0.00	0.00	0.00	-
Buses (Urban) - Diesel	365	42	0.225	100%	1.00	0.37	9.19	2.99	0.29	0.25	0.51	2344.10	0.00	0.03	0.01	0.00	0.00	0.00	8.91
Buses (Urban) - CNG	365	36	0.225	100%	NA	0.33	3.56	0.96	0.07	0.04	0.0004	2300.00	0.00	0.01	0.00	0.00	0.00	0.00	7.50
Total Operational Emissions													**0.01**	**0.11**	**0.14**	**0.00**	**0.00**	**0.00**	**30.96**

Idling																			
Stage	No. of days	Veh/Day[1]	Idling Time (min)	Fleet Usage (%)	Diesel to Hybrid Fuel Usage Ratio[2]	Emission Factor (g/hr)							Emissions (tpy)						
						VOC	NO_x	CO	PM_{10}	$PM_{2.5}$	SO_2	CO_2	VOC	NO_x	CO	PM_{10}	$PM_{2.5}$	SO_2	CO_2
Cars (LDGV)	365	64	5	100%	NA	8.00	1.88	67.13	0.06	0.03	0.02	2734.00	0.02	0.00	0.14	0.00	0.00	0.00	5.87
Trucks (HDDV)	365	98	5	100%	NA	2.91	26.41	20.45	1.10	1.01	0.76	3499.25	0.01	0.09	0.07	0.00	0.00	0.00	11.50
Trucks (HDGV-NGV)	365	100	5	100%	NA	3.48	2.48	44.08	0.14	0.10	0.00	-	0.01	0.01	0.15	0.00	0.00	0.00	-
Buses (Urban) - Diesel	365	42	10	100%	1.00	2.42	44.33	30.86	1.14	1.05	1.27	5860.25	0.01	0.12	0.09	0.00	0.00	0.00	16.50
Buses (Urban) - CNG	365	36	10	100%	NA	4.83	7.22	11.00	0.17	0.12	0.00	5750.00	0.01	0.02	0.03	0.00	0.00	0.00	13.88
Total Idling Emissions													**0.06**	**0.24**	**0.47**	**0.01**	**0.01**	**0.01**	**47.75**
Total Emissions													**0.07**	**0.35**	**0.61**	**0.01**	**0.01**	**0.01**	**78.71**

Notes
1) Total number of vehicles traveling in and out of the facility
2) Total distance traveled in and out of the facility is 0.45 mi. The distance for a vehicle traveling in or out is half (0.225 mi).

Table 8
Future On-Airport Vehicle Operational Emissions

Operation																			
Stage	**No. of days**	**Veh/Day[1]**	**Distance Traveled[2] (mi)**	**Fleet Usage (%)**	**Diesel to Hybrid Fuel Usage Ratio[2]**	**Emission Factor (g/mi)**							**Emissions (tpy)**						
						VOC	**NO_x**	**CO**	**PM_{10}**	**$PM_{2.5}$**	**SO_2**	**CO_2**	**VOC**	**NO_x**	**CO**	**PM_{10}**	**$PM_{2.5}$**	**SO_2**	**CO_2**
Cars (LDGV)	365	64	0.225	100%	NA	0.44	0.37	12.50	0.02	0.01	0.01	368.10	0.00	0.00	0.07	0.00	0.00	0.00	2.13
Trucks (HDDV)	365	98	0.225	100%	NA	0.44	5.75	1.98	0.22	0.18	0.30	1399.70	0.00	0.05	0.02	0.00	0.00	0.00	12.42
Trucks (HDGV-NGV)	365	100	0.225	100%	NA	0.21	1.22	3.84	0.06	0.04	0.00	-	0.00	0.01	0.03	0.00	0.00	0.00	-
Buses (Urban) - Diesel Hybrid	365	78	0.225	60%	1.25	0.37	9.19	2.99	0.29	0.25	0.51	2344.10	0.00	0.03	0.01	0.00	0.00	0.00	7.94
Buses (Urban) - CNG	365	78	0.225	40%	NA	0.33	3.56	0.96	0.07	0.04	0.0004	2300.00	0.00	0.01	0.00	0.00	0.00	0.00	6.50
Total Operational Emissions													**0.01**	**0.11**	**0.14**	**0.00**	**0.00**	**0.00**	**28.99**

Idling																			
Stage	**No. of days**	**Veh/Day[1]**	**Idling Time (min)**	**Fleet Usage (%)**	**Diesel to Hybrid Fuel Usage Ratio[2]**	**Emission Factor (g/hr)**							**Emissions (tpy)**						
						VOC	**NO_x**	**CO**	**PM_{10}**	**$PM_{2.5}$**	**SO_2**	**CO_2**	**VOC**	**NO_x**	**CO**	**PM_{10}**	**$PM_{2.5}$**	**SO_2**	**CO_2**
Cars (LDGV)	365	64	5	100%	NA	8.00	1.88	67.13	0.06	0.03	0.02	2734.00	0.02	0.00	0.14	0.00	0.00	0.00	5.87
Trucks (HDDV)	365	98	5	100%	NA	2.91	26.41	20.45	1.10	1.01	0.76	3499.25	0.01	0.09	0.07	0.00	0.00	0.00	11.50
Trucks (HDGV-NGV)	365	100	5	100%	NA	3.48	2.48	44.08	0.14	0.10	0.00	-	0.01	0.01	0.15	0.00	0.00	0.00	-
Buses (Urban) - Diesel Hybrid	365	78	10	60%	1.25	2.42	44.33	30.86	1.14	1.05	1.27	5860.25	0.01	0.11	0.08	0.00	0.00	0.00	14.71
Buses (Urban) - CNG	365	78	10	40%	NA	4.83	7.22	11.00	0.17	0.12	0.00	5750.00	0.01	0.02	0.02	0.00	0.00	0.00	12.03
Total Idling Emissions													**0.05**	**0.23**	**0.46**	**0.01**	**0.01**	**0.01**	**44.11**
Total Emissions													**0.07**	**0.33**	**0.60**	**0.01**	**0.01**	**0.01**	**73.10**

Notes
1) Total number of vehicles traveling in and out of the facility
2) Total distance traveled in and out of the facility is 0.45 mi. The distance for a vehicle traveling in or out is half (0.225 mi).

Table 9
Annual Vehicle Miles Traveled Emissions Excluding On-airport Loops

Bus Type	Days/Yr	Veh/Day[1]	Roundtrip Distance Traveled (mi)	Fleet Usage (%)	Diesel to Hybrid Fuel Usage Ratio[2]	Emission Factor (g/mi)[4]							Emissions (tpy)						
						NO_X	VOC	CO	PM_{10}	$PM_{2.5}$	SO_2	CO_2[3]	NO_X	VOC	CO	PM_{10}	$PM_{2.5}$	SO_2	CO_2
Baseline																			
ConRAC Diesel	365	21	2.44	100%	NA	8.77	0.32	2.48	0.29	0.25	0.51	2344.10	0.18	0.01	0.05	0.01	0.01	0.01	48.11
MPA CNG	365	18	2.44	100%	NA	3.71	0.26	0.79	0.07	0.05	0.00	2300	0.07	0.00	0.01	0.00	0.00	0.00	40.30
Total Existing Emissions													0.25	0.01	0.06	0.01	0.01	0.01	88.41
Future																			
Diesel-electric hybrid	365	39	1.30	60%	1.25	8.77	0.32	2.48	0.29	0.25	0.51	2344.10	0.09	0.00	0.02	0.00	0.00	0.00	22.95
CNG	365	39	1.30	40%	NA	3.71	0.26	0.79	0.07	0.05	0.00	2300	0.03	0.00	0.01	0.00	0.00	0.00	18.77
Total Future Emissions													*0.12*	*0.00*	*0.03*	*0.00*	*0.00*	*0.00*	*41.72*

Notes
1) Number of buses traveling in or out of the facility
2) Bus Maintenance Facility Project Definition Report. Massachusetts Port Authority, February 11, 2010.
3) Mobile6.2 natural gas emission factors are not available for CO2.
4) Emission factors are based on Mobile6.2 files received from Massachusetts DEP for 30 mph.

Table 10
Annual Boiler Emissions

Boiler Type	Building Square Footage (net increase)	Total Heat input per ft2 for 30 Btu/ft2 -hr (BTU/hr)	20% Safety Factor (BTU/hr)	AP-42 Emission factor[1,2]							Hourly Gas Volume (10^3 gal/hr)	Hourly Gas Volume (scf/hr)	Months of Heat Usage	Emissions (tons/yr)						
				NO_X	VOC	CO	PM_{10}	$PM_{2.5}$	SO_2[3]	CO_2				NO_X	VOC	CO	PM_{10}	$PM_{2.5}$	SO_2	CO_2
Baseline																				
#2 Fuel Oil	32,080	962,400	1,154,880	24	0.556	5	1.08	0.83	7.1	22300	0.0082	-	6	0.43	0.01	0.09	0.02	0.01	0.13	402.86
Future																				
Natural Gas	51,184	1,535,520	1,842,624	100	5.5	84	7.6	7.6	0.6	120000	-	1806.5	6	0.40	0.02	0.33	0.03	0.03	0.00	474.75

Notes
1) AP-42 Section 1.3 for #2 fuel oil and 1.4 for natural gas.
2) Emission factors are lb/10^3 gal for fuel oil and lb/10^6 scf for natural gas.
3) Assuming a 500 ppm Sulfur content for #2 fuel oil.

Source: 1. *Compilation of Air Pollution Emission Factors*. *Volume I: Stationary Point and Area Sources*. *Fifth Edition*. USEPA, July 1998.

Table 11
Total Net Change in Emissions Levels

Emission Source	Pollutant (tons/year)						
	VOC	NO_x	CO	PM_{10}	$PM_{2.5}$	SO_2	CO_2
Construction Emissions							
Construction Equipment	0.19	1.12	5.54	0.08	0.08	0.03	126.0
Construction Vehicles	0.2	2.45	1.08	0.09	0.08	0.13	603.6
Total Construction Emissions	**0.39**	**3.57**	**6.62**	**0.17**	**0.16**	**0.16**	**729.6**
Total CO_2 Eq (metric tons)							**668.5**
Baseline Operational Emissions							
Operational Vehicles	0.07	0.35	0.61	0.01	0.01	0.01	78.7
Boilers	0.1	0.43	0.09	0.02	0.01	0.13	402.9
Non-loop Bus Trips	0.01	0.25	0.06	0.01	0.01	0.01	88.4
Total Operational Emissions	**0.18**	**1.03**	**0.76**	**0.04**	**0.03**	**0.15**	**570.0**
Total CO_2 Eq (metric tons)							**522.3**
Build Operational Emissions (Area-wide)							
Operational Vehicles	0.07	0.33	0.60	0.01	0.01	0.01	73.1
Boilers	0.02	0.4	0.33	0.03	0.03	0	474.8
Non-loop Bus Trips	*0*	*0.12*	*0.03*	*0*	*0*	*0*	*41.7*
Total Operational Emissions	**0.09**	**0.85**	**0.96**	**0.04**	**0.04**	**0.01**	**589.6**
Total CO_2 Eq (metric tons)							**540.2**

4.2 Dispersion Modeling

The potential impacts from the source modeled GBD area were screened at the worst-case sensitive receptor location, which is approximately 100 feet away from the closest facility fence line. Based on the conservative SCREEN3 dispersion modeling results (**Table 12**), no exceedances of NAAQS or the proposed incremental SILs were predicted. Therefore the GBD on-airport operational air quality impacts would not be considered significant. Given the LOS conditions along the airport access roads, a hot spot impact modeling analysis for both CO and PM is not warranted. Therefore, the traffic-related CO and PM impacts from the GBD would also not be significant under the Proposed Action condition

Table 12
Total Predicted Concentrations

Pollutant	Averaging Time	Vehicles	Boilers	Total Predicted	Regional Incremental Standard	Background		Total	NAAQS
		µg/m^3				ppm	µg/m^3		
NO_2	1-hr	15.17	12.82	27.99		0.061	115.1	143.1	189
	Annual	0.39	0.26	0.65	-	0.016	30.72	31.4	100
CO	1-hr	23.08	14.36	37.44	-	1.7	1938	1,975.4	40000
	8-hr	16.16	10.05	26.21	-	1.3	1482	1,508.2	10000
SO_2	1-hr	0.59	0.10	0.70		0.027	70.5	71.2	1962
	3-hr	0.53	0.09	0.63	-	0.023	60.0	60.7	1300
	Daily	0.08	0.12	0.21	-	0.017	44.4	44.6	365
	Annual	0.02	0.05	0.07	-	0.005	13.1	13.1	80
PM_{10}	Daily	0.09	0.26	0.35	-		44	44.3	150
$PM_{2.5}$	Daily	0.08	0.26	0.33	2		30.5	30.8	35
	Annual	0.02	0.03	0.04	0.3		10.8	10.8	15

4.3 General Conformity Determination

The total combined annual nonattainment emissions associated with the proposed action are summarized in **Table 13**. Based on the comparison of the *de minimis* levels applicable to the nonattainment pollutants presented in **Table 13**, the proposed action would not require a formal conformity determination and thus would not have significant air quality impacts for the nonattainment pollutants.

Table 13
Total Emissions Levels Compared to *De Minimis* Levels (tons per year)

Emission Source	Pollutant		
	VOC	NO_x	CO
Total Construction Year Emissions	0.39	3.57	6.62
Baseline Operational Year	0.17	0.93	0.69
Future Operational Year	0.09	0.85	0.96
Proposed Net Change in Operational Year Emissions (Future – Baseline)	-0.08	-0.08	0.26
De Minimis Levels	50	100	100

4.4 Greenhouse Gas Emissions Inventory

Table 11 also provides the CO_2 Eq from combustions sources. The predicted construction and operational CO_2 Eq emissions would be approximately 669 metric tons and 540 metric tons, respectively. However, under the proposed action, a net annual increase of approximately 18 metric tons of operational CO_2 Eq emissions would result as shown in **Table 11**, as compared to baseline condition, primarily due to the increase of heating space as compared to the existing off-airport facility. However, a further CO_2 Eq emissions reduction is expected to be achieved from the GBD design plan that would meet the LEED design criteria and provides additional energy savings not considered as part of this study. Therefore, the results discussed in this study are considered conservative with respect to the greenhouse gas emission estimates from the proposed action and it is expected that an overall reduction of greenhouse gas emissions would be achieved from the GBD under the proposed action.

4.5 MSATs and PM

As discussed in Chapter 3, both MSATs and refined PM detailed analyses are not required under the proposed action and it can be assumed that no significant MSATs and refined PM impacts would result from the proposed action.

5. Mitigation Measures

The proposed action would result in a short-term air quality impacts from construction-activity related emissions. However, since the long-term benefit in reducing air emissions would be achieved under the proposed action demonstrated in previous chapters, no mitigation measures are warranted for the proposed action.

6. Cumulative Impacts

Since the proposed action would generally result in a reduction of air emissions under the operational condition, the cumulative air quality impact from the proposed action would not be significant.

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8. Appendix

A Tables
B SCREEN3 Areas Output Files

Appendix A - Tables

Table A-1
Hourly Trip Profile

Class	TOTAL			Subtotal Buses		Subtotal Other Vehicles		MPA Buses		ConRAC Buses		ConRAC Driver Trips		Maintenance Trips		Employee Trips		Other BMF Trips		Other CNG Fueling	
Time	IN	OUT	ALL	IN	OUT	IN	OUT	IN	OUT	IN	OUT	IN	OUT	IN	OUT	IN	OUT	IN	OUT	IN	OUT
0:00:00	5	3	8	2	0	3	3	1	0	1	0	1	1	0	0	2	2	0	0	0	0
1:00:00	17	9	26	14	6	3	3	8	4	6	2	3	3	0	0	0	0	0	0	0	0
2:00:00	1	0	1	1	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0
3:00:00	0	3	3	0	3	0	0	0	3	0	0	0	0	0	0	0	0	0	0	0	0
4:00:00	0	11	11	0	7	0	4	0	5	0	2	0	0	0	0	0	4	0	0	0	0
5:00:00	3	12	15	0	9	3	3	0	3	0	6	0	0	1	1	0	0	0	0	2	2
6:00:00	8	4	12	2	0	6	4	2	0	0	0	0	0	1	1	2	0	1	1	2	2
7:00:00	7	9	16	1	3	6	6	1	0	0	3	0	0	1	1	0	0	1	1	4	4
8:00:00	13	7	20	0	0	13	7	0	0	0	0	0	0	2	2	8	2	1	1	2	2
9:00:00	7	9	16	0	2	7	7	0	0	0	2	0	0	2	2	0	0	1	1	4	4
10:00:00	8	6	14	0	0	8	6	0	0	0	0	0	0	2	2	2	0	2	2	2	2
11:00:00	6	11	17	0	5	6	6	0	3	0	2	0	0	2	2	0	0	2	2	2	2
12:00:00	8	8	16	0	0	8	8	0	0	0	0	0	0	2	2	0	0	2	2	4	4
13:00:00	8	9	17	0	1	8	8	0	0	0	1	0	0	2	2	0	0	2	2	4	4
14:00:00	7	11	18	0	2	7	9	0	0	0	2	0	0	2	2	0	2	1	1	4	4
15:00:00	7	8	15	0	1	7	7	0	0	0	1	0	0	2	2	0	0	1	1	4	4
16:00:00	7	13	20	0	0	7	13	0	0	0	0	0	0	2	2	2	8	1	1	2	2
17:00:00	11	7	18	4	0	7	7	1	0	3	0	2	2	2	2	0	0	1	1	2	2
18:00:00	5	6	11	1	0	4	6	1	0	0	0	0	0	1	1	0	2	1	1	2	2
19:00:00	14	7	21	7	0	7	7	1	0	6	0	3	3	1	1	0	0	1	1	2	2
20:00:00	8	4	12	0	0	8	4	0	0	0	0	0	0	1	1	4	0	1	1	2	2
21:00:00	5	4	9	1	0	4	4	1	0	0	0	0	0	1	1	0	0	1	1	2	2
22:00:00	11	6	17	5	0	6	6	0	0	5	0	3	3	1	1	0	0	0	0	2	2
23:00:00	4	3	7	1	0	3	3	1	0	0	0	0	0	1	1	0	0	0	0	2	2
	170	**170**	**340**	**39**	**39**	**131**	**131**	**18**	**18**	**21**	**21**	**12**	**12**	**29**	**29**	**20**	**20**	**20**	**20**	**50**	**50**

Table A-2
Area 1 Traveling Emission Factors and Rates

										Mobile6 Emission Factors					Maximum Hourly Emission Rates				
Vehicle Category	**Vehicle Class**	**Fuel Type**	**Length**	**Screen3 Normalized Concentration**	**Max Vehicles**	**Total Vehicles**	**Area Activity**	**Fleet Usage**	**Diesel to Hybrid Fuel Usage Ratio[3]**	**NO_x**	**CO**	**SO_2**	**PM_{10}**	**$PM_{2.5}$**	**NO_x**	**CO**	**SO_2**	**PM_{10}**	**$PM_{2.5}$**
			mi	**µg/m³**	**hourly**	**daily**	**%**	**%**		**g/mi**					**g/sec**				
Total Buses																			
IN	UrbanBus	Diesel Hybrid	0.225	990.2	14	39	33%	60%	1.25	7.3512	2.39	0.41	0.23	0.20	0.01	0.00	0.00	0.00	0.00
	UrbanBus	CNG	0.225		14	39	33%	40%	NA	3.563	0.96	0.0004	0.07	0.04	0.00	0.00	0.00	0.00	0.00
OUT	UrbanBus	Diesel Hybrid	0.225		6	39	33%	60%	1.25	7.3512	2.39	0.41	0.23	0.20	0.00	0.00	0.00	0.00	0.00
	UrbanBus	CNG	0.225		6	39	33%	40%	NA	3.563	0.96	0.00	0.07	0.04	0.00	0.00	0.00	0.00	0.00
ConRAC Driver & Employee															0.01	0.00	0.00	0.00	0.00
IN	LDGV	Gasoline	0.225	990.2	3	32	33%	NA	NA	0.37	12.50	0.01	0.02	0.01	0.00	0.00	0.00	0.00	0.00
OUT	LDGV	Gasoline	0.225		3	32	33%	NA	NA	0.37	12.50	0.01	0.02	0.01	0.00	0.00	0.00	0.00	0.00
Maintenance & Other BMF																			
IN	HDDV	Diesel	0.225	990.2	0	49	33%	NA	NA	5.75	1.98	0.30	0.22	0.18	0.00	0.00	0.00	0.00	0.00
OUT	HDDV	Diesel	0.225		0	49	33%	NA	NA	5.75	1.98	0.30	0.22	0.18	0.00	0.00	0.00	0.00	0.00
Other CNG Fueling																			
IN	HDGV - NGV	CNG	0.225	990.2	0	50	33%	NA	NA	1.22	3.84	0.00	0.06	0.04	0.00	0.00	0.00	0.00	0.00
OUT	HDGV - NGV	CNG	0.225		0	50	33%	NA	NA	1.22	3.84	0.00	0.06	0.04	0.00	0.00	0.00	0.00	0.00
Total Traveling Concentrations															**0.01**	**0.01**	**0.00**	**0.00**	**0.00**

Table A-3
Area 1 Traveling Emission Factors and Rates Continued

	Maximum Daily Emission Rates					Maximum Hourly Concentrations				3-Hr Concentrations		8-Hr Concentrations		Daily Concentrations						Annual Concentrations					
Vehicle Category	**NO_x**	**CO**	**SO_2**	**PM_{10}**	**$PM_{2.5}$**	**NO_2**	**CO**	**SO_2**	**$PM_{2.5}$**	**3-Hr Persistence Factor**	**SO_2**	**8-Hr Persistence Factor**	**CO**	**Daily Persistence Factor**	**NO_2**	**CO**	**SO_2**	**PM_{10}**	**$PM_{2.5}$**	**Annual Persistence Factor**	**NO_2**	**CO**	**SO_2**	**PM_{10}**	**$PM_{2.5}$**
	g/sec					**µg/m³**									**µg/m³**						**µg/m³**				
Total Buses																									
IN	0.00	0.00	0.00	0.00	0.00	0.96	0.41	0.07	0.04	0.9	0.06	0.7	0.29	0.4	0.04	0.02	0.00	0.00	0.00	0.2	0.01	0.00	0.00	0.00	0.00
	0.00	0.00	0.00	0.00	0.00	0.31	0.11	0.00	0.00		0.00		0.08		0.01	0.01	0.00	0.00	0.00		0.00	0.00	0.00	0.00	0.00
OUT	0.00	0.00	0.00	0.00	0.00	0.41	0.18	0.03	0.02		0.03		0.12		0.04	0.02	0.00	0.00	0.00		0.01	0.00	0.00	0.00	0.00
	0.00	0.00	0.00	0.00	0.00	0.13	0.05	0.00	0.00		0.00		0.03		0.01	0.01	0.00	0.00	0.00		0.00	0.00	0.00	0.00	0.00
ConRAC Driver & Employee																									
IN	0.00	0.00	0.00	0.00	0.00	0.02	0.77	0.00	0.00	0.9	0.00	0.7	0.54	0.4	0.00	0.14	0.00	0.00	0.00	0.2	0.00	0.03	0.00	0.00	0.00
OUT	0.00	0.00	0.00	0.00	0.00	0.02	0.77	0.00	0.00		0.00		0.54		0.00	0.14	0.00	0.00	0.00		0.00	0.03	0.00	0.00	0.00
Maintenance & Other BMF																									
IN	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.9	0.00	0.7	0.00	0.4	0.07	0.03	0.01	0.00	0.00	0.2	0.01	0.01	0.00	0.00	0.00
OUT	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00		0.00		0.00		0.07	0.03	0.01	0.00	0.00		0.01	0.01	0.00	0.00	0.00
Other CNG Fueling																									
IN	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.9	0.00	0.7	0.00	0.4	0.02	0.07	0.00	0.00	0.00	0.2	0.00	0.01	0.00	0.00	0.00
OUT	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00		0.00		0.00		0.02	0.07	0.00	0.00	0.00		0.00	0.01	0.00	0.00	0.00
Total Traveling Concentrations	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**1.84**	**2.30**	**0.10**	**0.06**		**0.09**		**1.61**		**0.30**	**0.52**	**0.02**	**0.01**	**0.01**		**0.06**	**0.10**	**0.00**	**0.00**	**0.00**

Table A-4
Area 1 Idling Emission Factors and Rates

										Mobile6 Emission Factors					Maximum Hourly Emission Rates				
Vehicle Category	**Vehicle Class**	**Fuel Type**	**Time**	**Screen3 Normalized Concentration**	**Max Vehicles**	**Total Vehicles**	**Area Activity**	**Fleet Usage**	**Diesel to Hybrid Fuel Usage Ratio[3]**	**NO_x**	**CO**	**SO_2**	**PM_{10}**	**$PM_{2.5}$**	**NO_x**	**CO**	**SO_2**	**PM_{10}**	**$PM_{2.5}$**
			minute	**µg/m³**	**hourly**	**daily**	**%**	**%**		**g/mi**					**g/sec**				
Total Buses																			
IN	UrbanBus	Diesel Hybrid	10	990.2	14	39	33%	60%	1.25	35.46	24.68	1.02	0.91	0.84	0.02	0.01	0.00	0.00	0.00
	UrbanBus	CNG	10		14	39	33%	40%	NA	7.22	11.00	0.001	0.17	0.12	0.00	0.01	0.00	0.00	0.00
OUT	UrbanBus	Diesel Hybrid	10		6	39	33%	60%	1.25	35.46	24.68	1.02	0.91	0.84	0.01	0.01	0.00	0.00	0.00
	UrbanBus	CNG	10		6	39	33%	40%	NA	7.22	11.00	0.00	0.17	0.12	0.00	0.00	0.00	0.00	0.00
ConRAC Driver & Employee																			
IN	LDGV	Gasoline	5	990.2	3	32	0%	NA	NA	1.88	67.13	0.02	0.06	0.03	0.00	0.00	0.00	0.00	0.00
OUT	LDGV	Gasoline	5		3	32	0%	NA	NA	1.88	67.13	0.02	0.06	0.03	0.00	0.00	0.00	0.00	0.00
Maintenance & Other BMF																			
IN	HDGV	Gasoline	5	990.2	0	49	0%	NA	NA	26.405	20.4525	0.7615	1.0987	1.0108	0.00	0.00	0.00	0.00	0.00
OUT	HDGV	Gasoline	5		0	49	0%	NA	NA	26.405	20.4525	0.7615	1.0987	1.0108	0.00	0.00	0.00	0.00	0.00
Other CNG Fueling															0.00	0.00	0.00	0.00	0.00
IN	HDGV - NGV	CNG	5	990.2	0	50	0%	NA	NA	2.48	44.08	0.00	0.14	0.10	0.00	0.00	0.00	0.00	0.00
OUT	HDGV - NGV	CNG	5		0	50	0%	NA	NA	2.48	44.08	0.00	0.14	0.10	0.00	0.00	0.00	0.00	0.00
Total Idling Concentrations															**0.03**	**0.04**	**0.00**	**0.00**	**0.00**

Table A-5
Area 1 Idling Emission Factors and Rates Continued

	Maximum Daily Emission Rates					Maximum Hourly Concentrations				3-Hr Concentrations		8-Hr Concentrations		Daily Concentrations						Annual Concentrations					
Vehicle Category	**NO_x**	**CO**	**SO_2**	**PM_{10}**	**$PM_{2.5}$**	**NO_2**	**CO**	**SO_2**	**$PM_{2.5}$**	**3-Hr Persistence Factor**	**SO_2**	**8-Hr Persistence Factor**	**CO**	**Daily Persistence Factor**	**NO_2**	**CO**	**SO_2**	**PM_{10}**	**$PM_{2.5}$**	**Annual Persistence Factor**	**NO_2**	**CO**	**SO_2**	**PM_{10}**	**$PM_{2.5}$**
	g/sec					**µg/m³**									**µg/m³**						**µg/m³**				
Total Buses																									
IN	0.00	0.00	0.00	0.00	0.00	2.73	2.53	0.10	0.09	0.9	0.09	0.7	1.77	0.4	0.13	0.12	0.00	0.00	0.00	0.2	0.03	0.02	0.00	0.00	0.00
	0.00	0.00	0.00	0.00	0.00	0.46	0.94	0.00	0.01		0.00		0.66		0.02	0.04	0.00	0.00	0.00		0.00	0.01	0.00	0.00	0.00
OUT	0.00	0.00	0.00	0.00	0.00	1.17	1.09	0.04	0.04		0.04		0.76		0.13	0.12	0.00	0.00	0.00		0.03	0.02	0.00	0.00	0.00
	0.00	0.00	0.00	0.00	0.00	0.20	0.40	0.00	0.00		0.00		0.28		0.02	0.04	0.00	0.00	0.00		0.00	0.01	0.00	0.00	0.00
ConRAC Driver & Employee																									
IN	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.9	0.00	0.7	0.00	0.4	0.00	0.00	0.00	0.00	0.00	0.2	0.00	0.00	0.00	0.00	0.00
OUT	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00		0.00		0.00		0.00	0.00	0.00	0.00	0.00		0.00	0.00	0.00	0.00	0.00
Maintenance & Other BMF																									
IN	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.9	0.00	0.7	0.00	0.4	0.00	0.00	0.00	0.00	0.00	0.2	0.00	0.00	0.00	0.00	0.00
OUT	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00		0.00		0.00		0.00	0.00	0.00	0.00	0.00		0.00	0.00	0.00	0.00	0.00
Other CNG Fueling																									
IN	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.9	0.00	0.7	0.00	0.4	0.00	0.00	0.00	0.00	0.00	0.2	0.00	0.00	0.00	0.00	0.00
OUT	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00		0.00		0.00		0.00	0.00	0.00	0.00	0.00		0.00	0.00	0.00	0.00	0.00
Total Idling Concentrations	**0.01**	**0.01**	**0.00**	**0.00**	**0.00**	**4.56**	**4.97**	**0.15**	**0.14**		**0.13**		**3.48**		**0.30**	**0.32**	**0.01**	**0.01**	**0.01**		**0.06**	**0.06**	**0.00**	**0.00**	**0.00**
Total Concentrations						**6.40**	**7.26**	**0.25**	**0.19**		**0.23**		**5.08**		**0.60**	**0.85**	**0.03**	**0.02**	**0.02**		**0.12**	**0.17**	**0.01**	**0.00**	**0.00**

Table A-6
Area 2 Traveling Emission Factors and Rates

										Mobile6 Emission Factors					Maximum Hourly Emission Rates				
Vehicle Category	**Vehicle Class**	**Fuel Type**	**Length**	**Screen3 Normalized Concentration**	**Max Vehicles**	**Total Vehicles**	**Area Activity**	**Fleet Usage**	**Diesel to Hybrid Fuel Usage Ratio[3]**	**NO_x**	**CO**	**SO_2**	**PM_{10}**	**$PM_{2.5}$**	**NO_x**	**CO**	**SO_2**	**PM_{10}**	**$PM_{2.5}$**
			mi	**µg/m³**	**hourly**	**daily**	**%**	**%**		**g/mi**					**g/sec**				
Total Buses																			
IN	UrbanBus	Diesel Hybrid	0.225	644.6	14	39	33%	60%	1.25	7.3512	2.3944	0.40784	0.2316	0.20392	0.01	0.00	0.00	0.00	0.00
	UrbanBus	CNG	0.225		14	39	33%	40%	NA	3.563	0.96	0.0004	0.0671	0.0377	0.00	0.00	0.00	0.00	0.00
OUT	UrbanBus	Diesel Hybrid	0.225		6	39	33%	60%	1.25	7.3512	2.3944	0.40784	0.2316	0.20392	0.00	0.00	0.00	0.00	0.00
	UrbanBus	CNG	0.225		6	39	33%	40%	NA	3.563	0.96	0.0004	0.0671	0.0377	0.00	0.00	0.00	0.00	0.00
ConRAC Driver & Employee																			
IN	LDGV	Gasoline	0.225	644.6	3	32	33%	NA	NA	0.367	12.5	0.0067	0.0249	0.0114	0.00	0.00	0.00	0.00	0.00
OUT	LDGV	Gasoline	0.225		3	32	33%	NA	NA	0.367	12.5	0.0067	0.0249	0.0114	0.00	0.00	0.00	0.00	0.00
Maintenance & Other BMF																			
IN	HDDV	Diesel	0.225	644.6	0	49	33%	NA	NA	5.747	1.984	0.3046	0.2175	0.1788	0.00	0.00	0.00	0.00	0.00
OUT	HDDV	Diesel	0.225		0	49	33%	NA	NA	5.747	1.984	0.3046	0.2175	0.1788	0.00	0.00	0.00	0.00	0.00
Other CNG Fueling																			
IN	HDGV - NGV	CNG	0.225	644.6	0	50	33%	NA	NA	1.224	3.84	0.0007	0.0557	0.0384	0.00	0.00	0.00	0.00	0.00
OUT	HDGV - NGV	CNG	0.225		0	50	33%	NA	NA	1.224	3.84	0.0007	0.0557	0.0384	0.00	0.00	0.00	0.00	0.00
Total Traveling Concentrations															**0.01**	**0.01**	**0.00**	**0.00**	**0.00**

Table A-7
Area 2 Traveling Emission Factors and Rates Continued

	Maximum Daily Emission Rates					Maximum Hourly Concentrations				3-Hr Concentrations		8-Hr Concentrations		Daily Concentrations						Annual Concentrations					
Vehicle Category	**NO_x**	**CO**	**SO_2**	**PM_{10}**	**$PM_{2.5}$**	**NO_2**	**CO**	**SO_2**	**$PM_{2.5}$**	**3-Hr Persistence Factor**	**SO_2**	**8-Hr Persistence Factor**	**CO**	**Daily Persistence Factor**	**NO_2**	**CO**	**SO_2**	**PM_{10}**	**$PM_{2.5}$**	**Annual Persistence Factor**	**NO_2**	**CO**	**SO_2**	**PM_{10}**	**$PM_{2.5}$**
	g/sec					**µg/m³**									**µg/m³**						**µg/m³**				
Total Buses																									
IN	0.00	0.00	0.00	0.00	0.00	0.62	0.27	0.05	0.02	0.9	0.04	0.7	0.19	0.4	0.03	0.01	0.00	0.00	0.00	0.2	0.01	0.00	0.00	0.00	0.00
	0.00	0.00	0.00	0.00	0.00	0.20	0.07	0.00	0.00		0.00		0.05		0.01	0.00	0.00	0.00	0.00		0.00	0.00	0.00	0.00	0.00
OUT	0.00	0.00	0.00	0.00	0.00	0.27	0.12	0.02	0.01		0.02		0.08		0.03	0.01	0.00	0.00	0.00		0.01	0.00	0.00	0.00	0.00
	0.00	0.00	0.00	0.00	0.00	0.09	0.03	0.00	0.00		0.00		0.02		0.01	0.00	0.00	0.00	0.00		0.00	0.00	0.00	0.00	0.00
ConRAC Driver & Employee																									
IN	0.00	0.00	0.00	0.00	0.00	0.01	0.50	0.00	0.00	0.9	0.00	0.7	0.35	0.4	0.00	0.09	0.00	0.00	0.00	0.2	0.00	0.02	0.00	0.00	0.00
OUT	0.00	0.00	0.00	0.00	0.00	0.01	0.50	0.00	0.00		0.00		0.35		0.00	0.09	0.00	0.00	0.00		0.00	0.02	0.00	0.00	0.00
Maintenance & Other BMF																									
IN	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.9	0.00	0.7	0.00	0.4	0.05	0.02	0.00	0.00	0.00	0.2	0.01	0.00	0.00	0.00	0.00
OUT	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00		0.00		0.00		0.05	0.02	0.00	0.00	0.00		0.01	0.00	0.00	0.00	0.00
Other CNG Fueling																									
IN	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.9	0.00	0.7	0.00	0.4	0.01	0.04	0.00	0.00	0.00	0.2	0.00	0.01	0.00	0.00	0.00
OUT	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00		0.00		0.00		0.01	0.04	0.00	0.00	0.00		0.00	0.01	0.00	0.00	0.00
Total Traveling Concentrations	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**1.20**	**1.50**	**0.07**	**0.04**		**0.06**		**1.05**		**0.20**	**0.34**	**0.01**	**0.01**	**0.01**		**0.04**	**0.07**	**0.00**	**0.00**	**0.00**

Table A-8
Area 2 Idling Emission Factors and Rates

										Mobile6 Emission Factors					Maximum Hourly Emission Rates				
Vehicle Category	**Vehicle Class**	**Fuel Type**	**Time**	**Screen3 Normalized Concentration**	**Max Vehicles**	**Total Vehicles**	**Area Activity**	**Fleet Usage**	**Diesel to Hybrid Fuel Usage Ratio[3]**	**NO_x**	**CO**	**SO_2**	**PM_{10}**	**$PM_{2.5}$**	**NO_x**	**CO**	**SO_2**	**PM_{10}**	**$PM_{2.5}$**
			minute	**µg/m³**	**hourly**	**daily**	**%**	**%**		**g/mi**					**g/sec**				
Total Buses																			
IN	UrbanBus	Diesel Hybrid	10	644.6	14	39	33%	60%	1.25	35.46	24.68	1.02	0.91	0.84	0.02	0.01	0.00	0.00	0.00
	UrbanBus	CNG	10		14	39	33%	40%	NA	7.22	11.00	0.00	0.17	0.12	0.00	0.01	0.00	0.00	0.00
OUT	UrbanBus	Diesel Hybrid	10		6	39	33%	60%	1.25	35.46	24.68	1.02	0.91	0.84	0.01	0.01	0.00	0.00	0.00
	UrbanBus	CNG	10		6	39	33%	40%	NA	7.22	11.00	0.00	0.17	0.12	0.00	0.00	0.00	0.00	0.00
ConRAC Driver & Employee																			
IN	LDGV	Gasoline	5	644.6	3	32	100%	NA	NA	1.88	67.13	0.02	0.06	0.03	0.00	0.00	0.00	0.00	0.00
OUT	LDGV	Gasoline	5		3	32	100%	NA	NA	1.88	67.13	0.02	0.06	0.03	0.00	0.00	0.00	0.00	0.00
Maintenance & Other BMF																			
IN	HDGV	Gasoline	5	644.6	0	49	100%	NA	NA	26.41	20.45	0.76	1.10	1.01	0.00	0.00	0.00	0.00	0.00
OUT	HDGV	Gasoline	5		0	49	100%	NA	NA	26.41	20.45	0.76	1.10	1.01	0.00	0.00	0.00	0.00	0.00
Other CNG Fueling																			
IN	HDGV - NGV	CNG	5	644.6	0	50	0%	NA	NA	2.48	44.08	0.00	0.14	0.10	0.00	0.00	0.00	0.00	0.00
OUT	HDGV - NGV	CNG	5		0	50	0%	NA	NA	2.48	44.08	0.00	0.14	0.10	0.00	0.00	0.00	0.00	0.00
Total Idling Concentrations															**0.03**	**0.04**	**0.00**	**0.00**	**0.00**

Table A-9
Area 2 Idling Emission Factors and Rates Continued

	Maximum Daily Emission Rates					Maximum Hourly Concentrations				3-Hr Concentrations		8-Hr Concentrations		Daily Concentrations						Annual Concentrations					
Vehicle Category	**NO_x**	**CO**	**SO_2**	**PM_{10}**	**$PM_{2.5}$**	**NO_2**	**CO**	**SO_2**	**$PM_{2.5}$**	**3-Hr Persistence Factor**	**SO_2**	**8-Hr Persistence Factor**	**CO**	**Daily Persistence Factor**	**NO_2**	**CO**	**SO_2**	**PM_{10}**	**$PM_{2.5}$**	**Annual Persistence Factor**	**NO_2**	**CO**	**SO_2**	**PM_{10}**	**$PM_{2.5}$**
	g/sec					µg/m³									µg/m³						µg/m³				
Total Buses																									
IN	0.00	0.00	0.00	0.00	0.00	1.78	1.65	0.07	0.06	0.9	0.06	0.7	1.16	0.4	0.08	0.08	0.00	0.00	0.00	0.2	0.02	0.02	0.00	0.00	0.00
	0.00	0.00	0.00	0.00	0.00	0.30	0.61	0.00	0.01		0.00		0.43		0.01	0.03	0.00	0.00	0.00		0.00	0.01	0.00	0.00	0.00
OUT	0.00	0.00	0.00	0.00	0.00	0.76	0.71	0.03	0.02		0.03		0.50		0.08	0.08	0.00	0.00	0.00		0.02	0.02	0.00	0.00	0.00
	0.00	0.00	0.00	0.00	0.00	0.13	0.26	0.00	0.00		0.00		0.18		0.01	0.03	0.00	0.00	0.00		0.00	0.01	0.00	0.00	0.00
ConRAC Driver & Employee																									
IN	0.00	0.00	0.00	0.00	0.00	0.06	3.00	0.00	0.00	0.9	0.00	0.7	2.10	0.4	0.01	0.53	0.00	0.00	0.00	0.2	0.00	0.11	0.00	0.00	0.00
OUT	0.00	0.00	0.00	0.00	0.00	0.06	3.00	0.00	0.00		0.00		2.10		0.01	0.53	0.00	0.00	0.00		0.00	0.11	0.00	0.00	0.00
Maintenance & Other BMF																									
IN	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.9	0.00	0.7	0.00	0.4	0.24	0.25	0.01	0.01	0.01	0.2	0.05	0.05	0.00	0.00	0.00
OUT	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00		0.00		0.00		0.24	0.25	0.01	0.01	0.01		0.05	0.05	0.00	0.00	0.00
Other CNG Fueling																									
IN	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.9	0.00	0.7	0.00	0.4	0.00	0.00	0.00	0.00	0.00	0.2	0.00	0.00	0.00	0.00	0.00
OUT	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00		0.00		0.00		0.00	0.00	0.00	0.00	0.00		0.00	0.00	0.00	0.00	0.00
Total Idling Concentrations	**0.01**	**0.01**	**0.00**	**0.00**	**0.00**	**3.10**	**9.24**	**0.10**	**0.09**		**0.09**		**6.47**		**0.70**	**1.78**	**0.03**	**0.03**	**0.03**		**0.14**	**0.36**	**0.01**	**0.01**	**0.01**
Total Concentrations						**4.29**	**10.74**	**0.17**	**0.13**		**0.15**		**7.52**		**0.89**	**2.12**	**0.04**	**0.04**	**0.04**		**0.18**	**0.42**	**0.01**	**0.01**	**0.01**

Table A-10
Area 3 Traveling Emission Factors and Rates

										Mobile6 Emission Factors					Maximum Hourly Emission Rates				
Vehicle Category	**Vehicle Class**	**Fuel Type**	**Length**	**Screen3 Normalized Concentration**	**Max Vehicles**	**Total Vehicles**	**Area Activity**	**Fleet Usage**	**Diesel to Hybrid Fuel Usage Ratio[3]**	**NO_x**	**CO**	**SO_2**	**PM_{10}**	**$PM_{2.5}$**	**NO_x**	**CO**	**SO_2**	**PM_{10}**	**$PM_{2.5}$**
			mi	**µg/m³**	**hourly**	**daily**	**%**	**%**		**g/mi**					**g/sec**				
Total Buses																			
IN	UrbanBus	Diesel Hybrid	0.225	692.3	14	39	33%	60%	1.25	7.3512	2.3944	0.40784	0.2316	0.20392	0.01	0.00	0.00	0.00	0.00
	UrbanBus	CNG	0.225		14	39	33%	40%	NA	3.563	0.96	0.0004	0.0671	0.0377	0.00	0.00	0.00	0.00	0.00
OUT	UrbanBus	Diesel Hybrid	0.225		6	39	33%	60%	1.25	7.3512	2.3944	0.40784	0.2316	0.20392	0.00	0.00	0.00	0.00	0.00
	UrbanBus	CNG	0.225		6	39	33%	40%	NA	3.563	0.96	0.0004	0.0671	0.0377	0.00	0.00	0.00	0.00	0.00
ConRAC Driver & Employee																			
IN	LDGV	Gasoline	0.225	692.3	3	32	33%	NA	NA	0.367	12.5	0.0067	0.0249	0.0114	0.00	0.00	0.00	0.00	0.00
OUT	LDGV	Gasoline	0.225		3	32	33%	NA	NA	0.367	12.5	0.0067	0.0249	0.0114	0.00	0.00	0.00	0.00	0.00
Maintenance & Other BMF																			
IN	HDDV	Diesel	0.225	692.3	0	49	33%	NA	NA	5.747	1.984	0.3046	0.2175	0.1788	0.00	0.00	0.00	0.00	0.00
OUT	HDDV	Diesel	0.225		0	49	33%	NA	NA	5.747	1.984	0.3046	0.2175	0.1788	0.00	0.00	0.00	0.00	0.00
Other CNG Fueling																			
IN	HDGV - NGV	CNG	0.225	692.3	0	50	33%	NA	NA	1.224	3.84	0.0007	0.0557	0.0384	0.00	0.00	0.00	0.00	0.00
OUT	HDGV - NGV	CNG	0.225		0	50	33%	NA	NA	1.224	3.84	0.0007	0.0557	0.0384	0.00	0.00	0.00	0.00	0.00
Total Traveling Concentrations															**0.01**	**0.01**	**0.00**	**0.00**	**0.00**

Table A-11
Area 3 Traveling Emission Factors and Rates Continued

	Maximum Daily Emission Rates					Maximum Hourly Concentrations				3-Hr Concentrations		8-Hr Concentrations		Daily Concentrations						Annual Concentrations					
Vehicle Category	**NO_x**	**CO**	**SO_2**	**PM_{10}**	**$PM_{2.5}$**	**NO_2**	**CO**	**SO_2**	**$PM_{2.5}$**	**3-Hr Persistence Factor**	**SO_2**	**8-Hr Persistence Factor**	**CO**	**Daily Persistence Factor**	**NO_2**	**CO**	**SO_2**	**PM_{10}**	**$PM_{2.5}$**	**Annual Persistence Factor**	**NO_2**	**CO**	**SO_2**	**PM_{10}**	**$PM_{2.5}$**
	g/sec					**µg/m³**									**µg/m³**						**µg/m³**				
Total Buses																									
IN	0.00	0.00	0.00	0.00	0.00	0.67	0.29	0.05	0.02	0.9	0.04	0.7	0.20	0.4	0.03	0.01	0.00	0.00	0.00	0.2	0.01	0.00	0.00	0.00	0.00
	0.00	0.00	0.00	0.00	0.00	0.22	0.08	0.00	0.00		0.00		0.05		0.01	0.00	0.00	0.00	0.00		0.00	0.00	0.00	0.00	0.00
OUT	0.00	0.00	0.00	0.00	0.00	0.29	0.12	0.02	0.01		0.02		0.09		0.03	0.01	0.00	0.00	0.00		0.01	0.00	0.00	0.00	0.00
	0.00	0.00	0.00	0.00	0.00	0.09	0.03	0.00	0.00		0.00		0.02		0.01	0.00	0.00	0.00	0.00		0.00	0.00	0.00	0.00	0.00
ConRAC Driver & Employee																									
IN	0.00	0.00	0.00	0.00	0.00	0.01	0.54	0.00	0.00	0.9	0.00	0.7	0.38	0.4	0.00	0.10	0.00	0.00	0.00	0.2	0.00	0.02	0.00	0.00	0.00
OUT	0.00	0.00	0.00	0.00	0.00	0.01	0.54	0.00	0.00		0.00		0.38		0.00	0.10	0.00	0.00	0.00		0.00	0.02	0.00	0.00	0.00
Maintenance & Other BMF																									
IN	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.9	0.00	0.7	0.00	0.4	0.05	0.02	0.00	0.00	0.00	0.2	0.01	0.00	0.00	0.00	0.00
OUT	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00		0.00		0.00		0.05	0.02	0.00	0.00	0.00		0.01	0.00	0.00	0.00	0.00
Other CNG Fueling																									
IN	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.9	0.00	0.7	0.00	0.4	0.01	0.05	0.00	0.00	0.00	0.2	0.00	0.01	0.00	0.00	0.00
OUT	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00		0.00		0.00		0.01	0.05	0.00	0.00	0.00		0.00	0.01	0.00	0.00	0.00
Total Traveling Concentrations	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**1.29**	**1.61**	**0.07**	**0.04**		**0.06**		**1.12**		**0.21**	**0.37**	**0.01**	**0.01**	**0.01**		**0.04**	**0.07**	**0.00**	**0.00**	**0.00**

Table A-12
Area 3 Idling Emission Factors and Rates

										Mobile6 Emission Factors					Maximum Hourly Emission Rates				
Vehicle Category	**Vehicle Class**	**Fuel Type**	**Time**	**Screen3 Normalized Concentration**	**Max Vehicles**	**Total Vehicles**	**Area Activity**	**Fleet Usage**	**Diesel to Hybrid Fuel Usage Ratio[3]**	**NO_x**	**CO**	**SO_2**	**PM_{10}**	**$PM_{2.5}$**	**NO_x**	**CO**	**SO_2**	**PM_{10}**	**$PM_{2.5}$**
			minute	**µg/m³**	**hourly**	**daily**	**%**	**%**		**g/mi**					**g/sec**				
Total Buses																			
IN	UrbanBus	Diesel Hybrid	10	692.3	14	39	33%	60%	1.25	35.46	24.68	1.02	0.91	0.84	0.02	0.01	0.00	0.00	0.00
	UrbanBus	CNG	10		14	39	33%	40%	NA	7.22	11.00	0.00	0.17	0.12	0.00	0.01	0.00	0.00	0.00
OUT	UrbanBus	Diesel Hybrid	10		6	39	33%	60%	1.25	35.46	24.68	1.02	0.91	0.84	0.01	0.01	0.00	0.00	0.00
	UrbanBus	CNG	10		6	39	33%	40%	NA	7.22	11.00	0.00	0.17	0.12	0.00	0.00	0.00	0.00	0.00
ConRAC Driver & Employee																			
IN	LDGV	Gasoline	5	692.3	3	32	0%	NA	NA	1.88	67.13	0.02	0.06	0.03	0.00	0.00	0.00	0.00	0.00
OUT	LDGV	Gasoline	5		3	32	0%	NA	NA	1.88	67.13	0.02	0.06	0.03	0.00	0.00	0.00	0.00	0.00
Maintenance & Other BMF																			
IN	HDGV	Gasoline	5	692.3	0	49	0%	NA	NA	26.41	20.45	0.76	1.10	1.01	0.00	0.00	0.00	0.00	0.00
OUT	HDGV	Gasoline	5		0	49	0%	NA	NA	26.41	20.45	0.76	1.10	1.01	0.00	0.00	0.00	0.00	0.00
Other CNG Fueling																			
IN	HDGV - NGV	CNG	5	692.3	0	50	100%	NA	NA	2.48	44.08	0.00	0.14	0.10	0.00	0.00	0.00	0.00	0.00
OUT	HDGV - NGV	CNG	5		0	50	100%	NA	NA	2.48	44.08	0.00	0.14	0.10	0.00	0.00	0.00	0.00	0.00
Total Idling Concentrations															**0.03**	**0.04**	**0.00**	**0.00**	**0.00**

Table A-13
Area 3 Idling Emission Factors and Rates Continued

	Maximum Daily Emission Rates					Maximum Hourly Concentrations				3-Hr Concentrations		8-Hr Concentrations		Daily Concentrations						Annual Concentrations					
Vehicle Category	**NO_x**	**CO**	**SO_2**	**PM_{10}**	**$PM_{2.5}$**	**NO_2**	**CO**	**SO_2**	**$PM_{2.5}$**	**3-Hr Persistence Factor**	**SO_2**	**8-Hr Persistence Factor**	**CO**	**Daily Persistence Factor**	**NO_2**	**CO**	**SO_2**	**PM_{10}**	**$PM_{2.5}$**	**Annual Persistence Factor**	**NO_2**	**CO**	**SO_2**	**PM_{10}**	**$PM_{2.5}$**
	g/sec					**µg/m³**									**µg/m³**						**µg/m³**				
Total Buses																									
IN	0.00	0.00	0.00	0.00	0.00	1.91	1.77	0.07	0.06	0.9	0.07	0.7	1.24	0.4	0.09	0.08	0.00	0.00	0.00	0.2	0.02	0.02	0.00	0.00	0.00
	0.00	0.00	0.00	0.00	0.00	0.32	0.66	0.00	0.01		0.00		0.46		0.02	0.03	0.00	0.00	0.00		0.00	0.01	0.00	0.00	0.00
OUT	0.00	0.00	0.00	0.00	0.00	0.82	0.76	0.03	0.03		0.03		0.53		0.09	0.08	0.00	0.00	0.00		0.02	0.02	0.00	0.00	0.00
	0.00	0.00	0.00	0.00	0.00	0.14	0.28	0.00	0.00		0.00		0.20		0.02	0.03	0.00	0.00	0.00		0.00	0.01	0.00	0.00	0.00
ConRAC Driver & Employee																									
IN	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.9	0.00	0.7	0.00	0.4	0.00	0.00	0.00	0.00	0.00	0.2	0.00	0.00	0.00	0.00	0.00
OUT	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00		0.00		0.00		0.00	0.00	0.00	0.00	0.00		0.00	0.00	0.00	0.00	0.00
Maintenance & Other BMF																									
IN	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.9	0.00	0.7	0.00	0.4	0.00	0.00	0.00	0.00	0.00	0.2	0.00	0.00	0.00	0.00	0.00
OUT	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00		0.00		0.00		0.00	0.00	0.00	0.00	0.00		0.00	0.00	0.00	0.00	0.00
Other CNG Fueling																									
IN	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.9	0.00	0.7	0.00	0.4	0.02	0.59	0.00	0.00	0.00	0.2	0.00	0.12	0.00	0.00	0.00
OUT	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00		0.00		0.00		0.02	0.59	0.00	0.00	0.00		0.00	0.12	0.00	0.00	0.00
Total Idling Concentrations	**0.01**	**0.01**	**0.00**	**0.00**	**0.00**	**3.19**	**3.47**	**0.10**	**0.10**		**0.09**		**2.43**		**0.26**	**1.40**	**0.01**	**0.01**	**0.01**		**0.05**	**0.28**	**0.00**	**0.00**	**0.00**
Total Concentrations						**4.48**	**5.08**	**0.18**	**0.14**		**0.16**		**3.56**		**0.47**	**1.77**	**0.02**	**0.02**	**0.02**		**0.09**	**0.35**	**0.00**	**0.00**	**0.00**

Table A-14
Boiler NO_2 Emissions

Building	Unit Size Square Feet (net increase)	Total Heat input per ft^2 for 30 $Btu/ft^2 \cdot hr$ (BTU/hr)	20% Safety Factor (BTU/hr)	AP-42 Emission factor (lb/106 scf)	Hourly Gas Volume (scf/hr)	Emission Rate (lb/hr)	Emission Rate (g/s)	SCREEN3 Normalized Concentration ($\mu g/m^3$)	Maximum Hourly Concentration ($\mu g/m^3$)	Daily Usage (hr)	Annual Usage (mths)	Annual Persistence Factor	Annual Concentration ($\mu g/m^3$)
Administration Building	8,652	259,560	311,472	100	305.4	0.031	0.0038	634.8	1.832	12	6	0.08	0.037
Maintenance Building	12,705	381,150	457,380	100	448.4	0.045	0.0056	634.8	2.690	12	6	0.08	0.054
Shops	8,894	266,820	320,184	100	313.9	0.031	0.0040	634.8	1.883	12	6	0.08	0.038
Enclosed Bus Storage (Barn)	20,933	627,990	753,588	100	738.8	0.074	0.0093	918.8	6.415	12	6	0.08	0.128
Total Emissions for Boilers									**12.820**				**0.256**

Table A-15
Boiler CO Emissions

Building	Unit Size Square Feet (net increase)	Total Heat input per ft^2 for 30 $Btu/ft^2 \cdot hr$ (BTU/hr)	20% Safety Factor (BTU/hr)	AP-42 Emission factor (lb/106 scf)	Hourly Gas Volume (scf/hr)	Emission Rate (lb/hr)	Emission Rate (g/s)	SCREEN3 Normalized Concentration ($\mu g/m^3$)	Maximum Hourly Concentration ($\mu g/m^3$)	8-Hr Persistence Factor	8-Hr Concentration ($\mu g/m^3$)
Administration Building	8,652	259,560	311,472	84	305.4	0.026	0.0032	634.8	2.052	0.7	1.436
Maintenance Building	12,705	381,150	457,380	84	448.4	0.038	0.0047	634.8	3.013	0.7	2.109
Shops	8,894	266,820	320,184	84	313.9	0.026	0.0033	634.8	2.109	0.7	1.476
Enclosed Bus Storage (Barn)	20,933	627,990	753,588	84	738.8	0.062	0.0078	918.8	7.185	0.7	5.029
Total Emissions for Boilers									**14.358**		**10.050**

Table A-16
Boiler PM_{10} Emissions

Building	Unit Size Square Feet (net increase)	Total Heat input per ft^2 for 30 $Btu/ft^2 \cdot hr$ (BTU/hr)	20% Safety Factor (BTU/hr)	AP-42 Emission factor (lb/106 scf)	Hourly Gas Volume (scf/hr)	Emission Rate (lb/hr)	Emission Rate (g/s)	SCREEN3 Normalized Concentration ($\mu g/m^3$)	Maximum Hourly Concentration ($\mu g/m^3$)	Daily Usage (hr)	Daily Persistence Factor	Daily Concentration ($\mu g/m^3$)
Administration Building	8,652	259,560	311,472	7.6	305.4	0.002	0.0003	634.8	0.186	12	0.4	0.037
Maintenance Building	12,705	381,150	457,380	7.6	448.4	0.003	0.0004	634.8	0.273	12	0.4	0.055
Shops	8,894	266,820	320,184	7.6	313.9	0.002	0.0003	634.8	0.191	12	0.4	0.038
Enclosed Bus Storage (Barn)	20,933	627,990	753,588	7.6	738.8	0.006	0.0007	918.8	0.650	12	0.4	0.130
Total Emissions for Boilers									**1.299**			**0.260**

Table A-17
Boiler $PM_{2.5}$ Emissions

Building	Unit Size Square Feet (net increase)	Total Heat input per ft^2 for 30 $Btu/ft^2 \cdot hr$ (BTU/hr)	20% Safety Factor (BTU/hr)	AP-42 Emission factor (lb/106 scf)	Hourly Gas Volume (scf/hr)	Emission Rate (lb/hr)	Emission Rate (g/s)	SCREEN3 Normalized Concentration ($\mu g/m^3$)	Maximum Hourly Concentration ($\mu g/m^3$)	Daily Usage (hr)	Daily Persistence Factor	Daily Concentration ($\mu g/m^3$)	Annual Usage (mths)	Annual Persistence Factor	Annual Concentration ($\mu g/m^3$)
Administration Building	8,652	259,560	311,472	7.6	305.4	0.002	0.0003	634.8	0.186	12	0.4	0.037	6	0.08	0.004
Maintenance Building	12,705	381,150	457,380	7.6	448.4	0.00	0.0004	634.8	0.273	12	0.4	0.055	6	0.08	0.005
Shops	8,894	266,820	320,184	7.6	313.9	0.00	0.0003	634.8	0.191	12	0.4	0.038	6	0.08	0.004
Enclosed Bus Storage (Barn)	20,933	627,990	753,588	7.6	738.8	0.01	0.0007	918.8	0.650	12	0.4	0.130	6	0.08	0.013
Total Emissions for Boilers									**1.299**			**0.260**			**0.026**

Table A-18
Boiler SO_2 Emissions

Building	Unit Size Square Feet (net increase)	Total Heat input per ft^2 for 30 Btu/ft^2-hr (BTU/hr)	20% Safety Factor (BTU/hr)	AP-42 Emission factor (lb/106 scf)	Hourly Gas Volume (scf/hr)	Emission Rate (lb/hr)	Emission Rate (g/s)	SCREEN3 Normalized Concentration ($\mu g/m^3$)	Maximum Hourly Concentration ($\mu g/m^3$)	3-Hr Persistence Factor	3-Hr Concentration ($\mu g/m^3$)	Daily Usage (hr)	Daily Persistence Factor	Daily Concentration ($\mu g/m^3$)	Annual Usage (mths)	Annual Persistence Factor	Annual Concentration ($\mu g/m^3$)
Administration Building	8,652	259,560	311,472	0.6	305.4	0.000	0.0000	634.8	0.015	0.9	0.013	12	0.4	0.003	6	0.08	0.0003
Maintenance Building	12,705	381,150	457,380	0.6	448.4	0.00	0.0000	634.8	0.022	0.9	0.019	12	1.4	0.015	6	1.08	0.0058
Shops	8,894	266,820	320,184	0.6	313.9	0.00	0.0000	634.8	0.015	0.9	0.014	12	2.4	0.018	6	2.08	0.0078
Enclosed Bus Storage (Barn)	20,933	627,990	753,588	0.6	738.8	0.00	0.0001	918.8	0.051	0.9	0.046	12	3.4	0.087	6	3.08	0.0395
Total Emissions for Boilers									**0.103**		**0.092**			**0.123**			**0.0535**

Appendix B - SCREEN3 Areas Output Files

Appendix B1
SCREEN3 Area 1 Output File

```
07/08/10

18:09:26
  ***  SCREEN3 MODEL RUN  ***
  *** VERSION DATED 96043 ***

 Massport_Area1_070810

 SIMPLE TERRAIN INPUTS:
    SOURCE TYPE                =         AREA
    EMISSION RATE (G/(S-M**2))  =      .160900E-03
    SOURCE HEIGHT (M)          =       3.0500
    LENGTH OF LARGER SIDE (M)   =     133.3000
    LENGTH OF SMALLER SIDE (M)  =      46.6000
    RECEPTOR HEIGHT (M)        =       1.5200
    URBAN/RURAL OPTION         =        URBAN
 THE REGULATORY (DEFAULT) MIXING HEIGHT OPTION WAS SELECTED.
 THE REGULATORY (DEFAULT) ANEMOMETER HEIGHT OF 10.0 METERS WAS ENTERED.

    ANGLE RELATIVE TO LONG AXIS =      90.0000


 BUOY. FLUX =     .000 M**4/S**3;  MOM. FLUX =     .000 M**4/S**2.

 *** FULL METEOROLOGY ***

 **********************************
 *** SCREEN DISCRETE DISTANCES ***
 **********************************

 *** TERRAIN HEIGHT OF    0. M ABOVE STACK BASE USED FOR FOLLOWING
DISTANCES ***

   DIST     CONC             U10M   USTK  MIX HT   PLUME  MAX DIR
    (M)   (UG/M**3)   STAB  (M/S)  (M/S)    (M)   HT (M)   (DEG)
 -------  ----------  ----  -----  -----  ------  ------  -------
     63.   990.2        5     1.0    1.0 10000.0    3.05     90.

      ************************************
      *** SUMMARY OF SCREEN MODEL RESULTS ***
      ************************************

  CALCULATION        MAX CONC    DIST TO   TERRAIN
   PROCEDURE        (UG/M**3)    MAX (M)    HT (M)
 --------------    -----------   -------   -------
 SIMPLE TERRAIN      990.2           63.        0.


 ************************************************
 ** REMEMBER TO INCLUDE BACKGROUND CONCENTRATIONS **
 ************************************************
```

Appendix B2
SCREEN3 Area 2 Output File

```
07/08/10

18:18:16
  ***  SCREEN3 MODEL RUN  ***
  *** VERSION DATED 96043 ***

 Massport_Area2_070810

 SIMPLE TERRAIN INPUTS:
    SOURCE TYPE                =         AREA
    EMISSION RATE (G/(S-M**2))  =      .215100E-03
    SOURCE HEIGHT (M)          =       3.0500
    LENGTH OF LARGER SIDE (M)   =     152.8000
    LENGTH OF SMALLER SIDE (M)  =      30.4000
    RECEPTOR HEIGHT (M)        =       1.5200
    URBAN/RURAL OPTION         =        URBAN
 THE REGULATORY (DEFAULT) MIXING HEIGHT OPTION WAS SELECTED.
 THE REGULATORY (DEFAULT) ANEMOMETER HEIGHT OF 10.0 METERS WAS ENTERED.

    ANGLE RELATIVE TO LONG AXIS =      90.0000


 BUOY. FLUX =     .000 M**4/S**3;  MOM. FLUX =     .000 M**4/S**2.

 *** FULL METEOROLOGY ***

 *********************************
 *** SCREEN DISCRETE DISTANCES ***
 *********************************

 *** TERRAIN HEIGHT OF    0. M ABOVE STACK BASE USED FOR FOLLOWING
DISTANCES ***

   DIST     CONC             U10M   USTK  MIX HT   PLUME  MAX DIR
    (M)   (UG/M**3)   STAB  (M/S)  (M/S)    (M)   HT (M)   (DEG)
 -------  ----------  ----  -----  -----  ------  ------  -------
     98.   644.6         5     1.0    1.0 10000.0    3.05     90.

      ***************************************
      *** SUMMARY OF SCREEN MODEL RESULTS ***
      ***************************************

  CALCULATION         MAX CONC    DIST TO   TERRAIN
   PROCEDURE         (UG/M**3)    MAX (M)    HT (M)
 --------------    -----------   -------   -------
 SIMPLE TERRAIN      644.6           98.        0.


 **************************************************
 ** REMEMBER TO INCLUDE BACKGROUND CONCENTRATIONS **
 **************************************************
```

Appendix B3
SCREEN3 Area 3 Output File

```
07/08/10

18:28:00
  ***  SCREEN3 MODEL RUN  ***
  *** VERSION DATED 96043 ***

 Massport_Area3

 SIMPLE TERRAIN INPUTS:
    SOURCE TYPE                =         AREA
    EMISSION RATE (G/(S-M**2))  =      .230900E-03
    SOURCE HEIGHT (M)          =       3.0500
    LENGTH OF LARGER SIDE (M)   =     112.4000
    LENGTH OF SMALLER SIDE (M)  =      38.6000
    RECEPTOR HEIGHT (M)        =       1.5200
    URBAN/RURAL OPTION         =        URBAN
 THE REGULATORY (DEFAULT) MIXING HEIGHT OPTION WAS SELECTED.
 THE REGULATORY (DEFAULT) ANEMOMETER HEIGHT OF 10.0 METERS WAS ENTERED.

    ANGLE RELATIVE TO LONG AXIS =      90.0000


 BUOY. FLUX =     .000 M**4/S**3;  MOM. FLUX =     .000 M**4/S**2.

 *** FULL METEOROLOGY ***

 **********************************
 *** SCREEN DISCRETE DISTANCES ***
 **********************************

 *** TERRAIN HEIGHT OF    0. M ABOVE STACK BASE USED FOR FOLLOWING
DISTANCES ***

   DIST     CONC             U10M   USTK  MIX HT   PLUME  MAX DIR
    (M)   (UG/M**3)   STAB  (M/S)  (M/S)    (M)   HT (M)   (DEG)
 -------  ----------  ----  -----  -----  ------  ------  -------
    133.   692.3        5     1.0    1.0 10000.0    3.05     90.

      ***************************************
      *** SUMMARY OF SCREEN MODEL RESULTS ***
      ***************************************

  CALCULATION        MAX CONC    DIST TO   TERRAIN
   PROCEDURE        (UG/M**3)    MAX (M)    HT (M)
 --------------    -----------   -------   -------
 SIMPLE TERRAIN      692.3          133.        0.


 **************************************************
 ** REMEMBER TO INCLUDE BACKGROUND CONCENTRATIONS **
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